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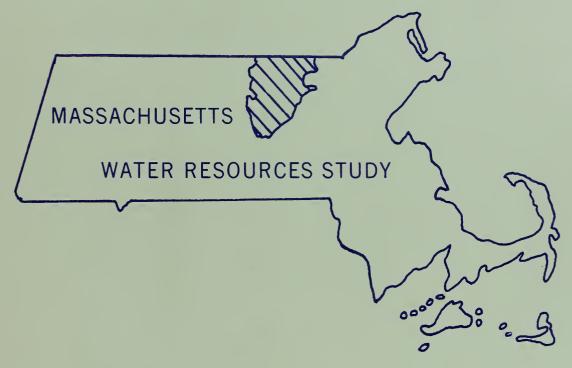
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INVENTORY

of

POTENTIAL and EXISTING UPSTREAM RESERVOIR SITES

NASHUA STUDY AREA Massachusetts



U.S. DEPARTMENT of AGRICULTURE
Soil Conservation Service
Economic Research Service
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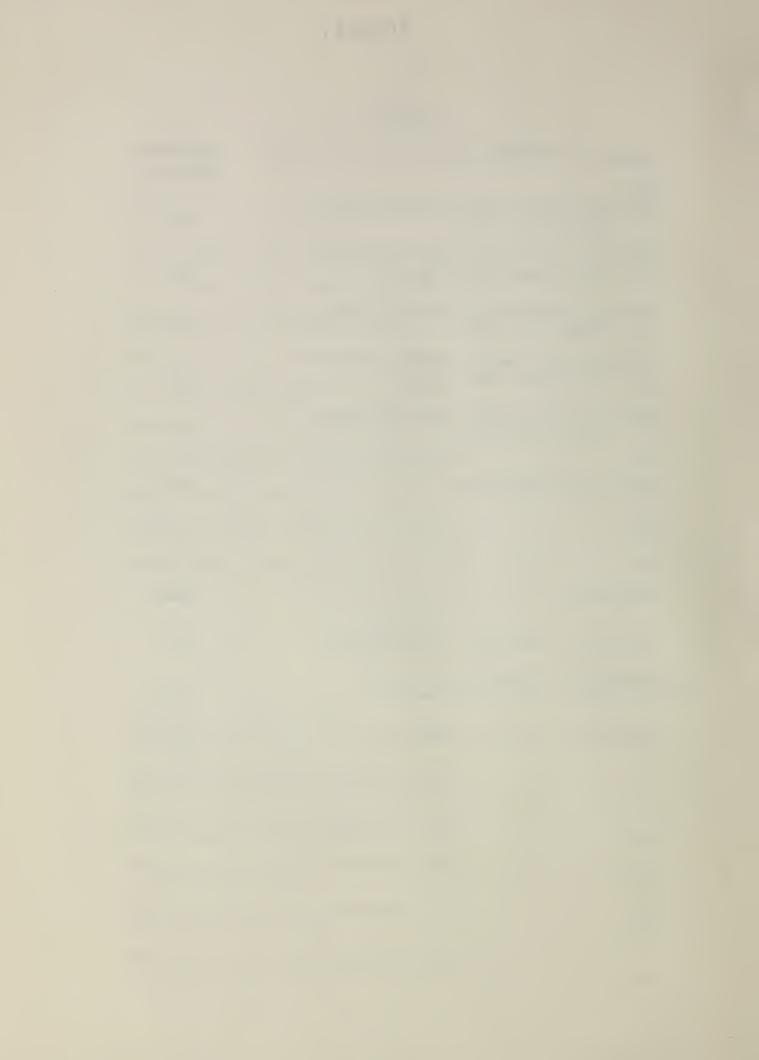
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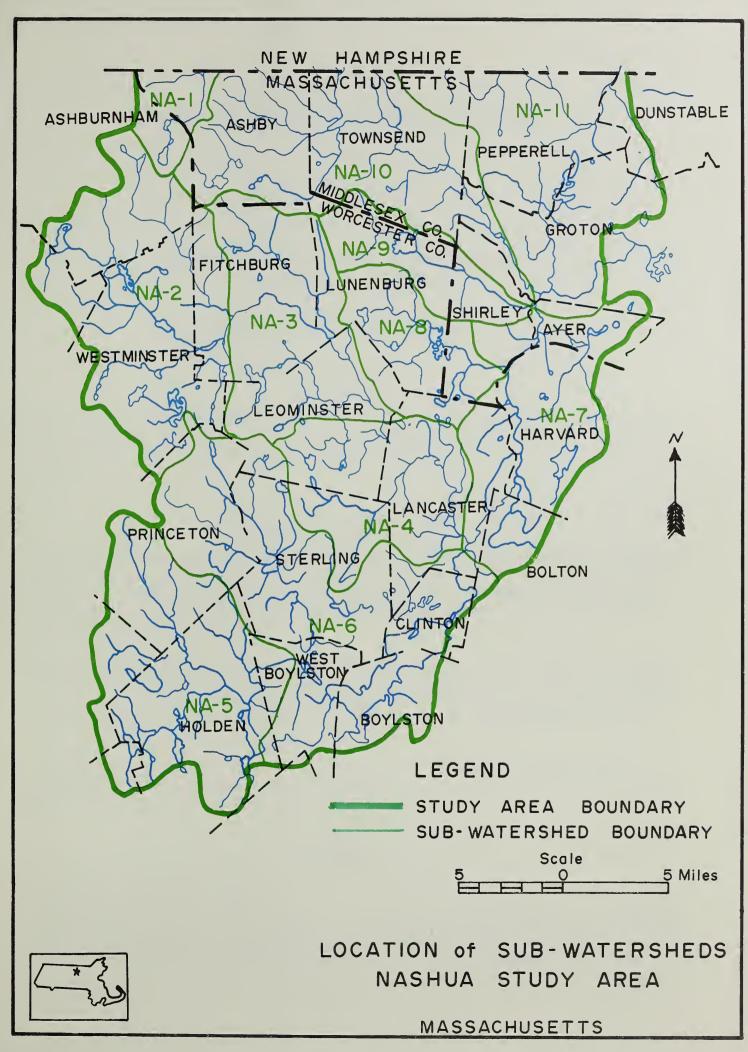
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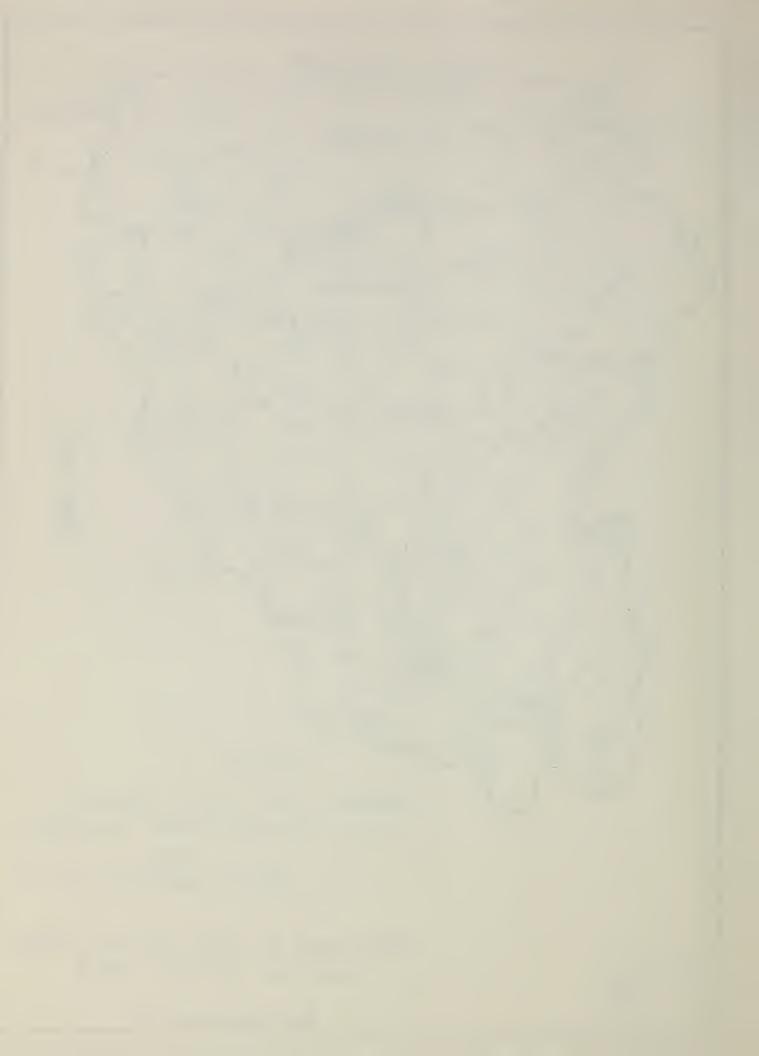
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INVENTORY OF

POTENTIAL AND EXISTING UPSTREAM RESERVOIR SITES

in the

NASHUA STUDY AREA

Prepared by the

UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE

in cooperation with the MASSACHUSETTS WATER RESOURCES COMMISSION

INTRODUCTION

This report presents data on 220 potential and 69 existing reservoir sites in the Nashua Study Area, Worcester and Middlesex Counties. Detailed information and design summaries have been prepared for 137 of the potential sites.

DESCRIPTION OF STUDY AREA

The Nashua Study Area is located in north central Massachusetts in Worcester and Middlesex Counties. The Study Area includes all of the Nashua River Watershed in Massachusetts and the Massachusetts portion of the Souhegan River Watershed. Both the Nashua and Souhegan Rivers are tributaries to the Merrimack River.

The Souhegan flows into the Merrimack at Merrimack, New Hampshire, while the Nashua joins the Merrimack at Nashua, New Hampshire. The greater part of the Nashua River drainage area is in Massachusetts with a small portion in New Hampshire. The Souhegan is a New Hampshire watershed with only five per cent in Massachusetts.

The Study Area covers about 291,000 acres or 454 square miles and is divided into 11 subwatersheds. Portions of 27 cities and towns lie within the study area boundaries.

CRITERIA

Potential Reservoir Sites

The primary considerations used to identify potential reservoir sites were: suitable topography, a compact economical dam location, sufficient drainage area to maintain the proposed reservoir, and an undeveloped pool area.

The following criteria were used as a guide in site selection:

- 1. Drainage area -- larger than one half square mile, but not greater than 50 square miles.
- 2. Ratio of drainage area to potential beneficial pool surface -- not less than 10 to 1.
- 3. Minimum beneficial pool depth -- 7 feet at the dam.
- 4. Minimum beneficial pool area -- 10 acres.
- 5. Minimum beneficial pool capacity -- 100 acre feet.
- 6. Maximum beneficial pool capacity -- volume equal to 25 inches of runoff from the drainage area.
- 7. Maximum height of dam -- 100 feet.
- 8. Pool area relatively undeveloped -- no housing developments or major highways inundated.

Existing Reservoirs

Existing reservoirs were located using the USGS quadrangle sheets. Two criteria were used to determine sites to be included in this report:

- 1. Surface area -- at least 10 surface acres.
- 2. Man-made dam -- Natural ponds and beaver dams are excluded.

INVESTIGATIONS AND ANALYSES

Potential Reservoir Sites

Sites were located using the latest available U.S. Geological Survey 7½ minute quadrangle sheets. Natural basins, or topography favorable for storage of water, and an economical location for an embankment were the primary considerations in the initial site selection. Watershed boundaries were delineated on the quadrangle sheets and the drainage area was determined for each initial site selected. Water storage areas and volumes available upstream of the site centerline were calculated. Data were also obtained to calculate the volume of earth fill required for the dam and any supplementary dikes that might be needed to contain a reservoir.

At each potential site, an engineer made a field reconnaissance that included an inventory of land and facilities (man-made structures) that would be affected if a dam and reservoir were constructed on the site. If it was determined that the reservoir would flood extensive man-made

facilities; or a study of the elevation-area-storage data showed that the site did not meet criteria for the study, the site was dropped from further consideration. This report contains data which was developed for sites in this category with an explanation of why they were eliminated from further study. The sites which did not meet study criteria because of small drainage areas might be suitable as private developments for fire protection, stock water, recreation, etc.

A geologist made a surficial investigation of each potential site to determine any obvious geologic conditions that might affect the site's waterholding capability or require extensive foundation preparation. A preliminary geological report was prepared which outlined the types of materials which might be expected at the site and their effect on construction costs and waterholding capabilities for the site. The report of geologic conditions was based on the geologist's interpretation following the surficial investigation of the site and the surrounding area. No borings were made at any site and subsurface conditions may vary from those indicated in this report.

Hydrologic and hydraulic data were calculated using methods developed by the Soil Conservation Service. Rainfall data were obtained from Technical Paper 40 and 49, U. S. Department of Commerce, Weather Bureau.

Preliminary design calculations for several levels of development for each site were processed by electronic computer, using a program which determines the most economical type of principal spillway; determines the runoff and peak flow for the 100-year frequency, 10-day duration principal spillway design storm; routes the design storm to set the emergency spillway crest; performs other routings to determine the design high water and top of dam elevations; calculates embankment yardage and other construction quantities; determines the total estimated cost of the reservoir; and estimates "safe yield" for water supply purposes.

Existing Reservoirs

In addition to the potential site inventory, an inventory was made of 69 existing reservoirs that cover at least 10 surface acres and are formed by a man-made dam. The reservoirs were located using the USGS quadrangle sheets. A field reconnaissance was made to determine the physical condition of each structure and to assess the potential for expansion of the reservoir. While at the site, photographs were taken. The better photographs are included in this report. The ownership and use of many of the reservoirs were also obtained from records of the Worcester County Engineer and the Massachusetts Department of Public Works.

COSTS

Preliminary cost estimates for potential reservoir sites were based on costs and land values as of 1971. The cost estimates include: (1) construction costs; (2) contingencies; (3) engineering and administrative services necessary for surveys, geology, final design, and construction inspection; (4) cost for land required for the reservoir and construction of the dam and spillway; and (5) costs associated with the purchase or relocation of manmade facilities affected by the constructed reservoir.

Construction costs were based on recent dam construction contract costs in Massachusetts. A factor for contingencies, equal to 15% to 25% of the construction cost, was included to account for the cost of items that might not have been considered at this intensity of study. Engineering and administrative services ranged from 20% to 40% of the construction cost.

Costs for land acquisition were based on an evaluation of current real estate transactions and market conditions. Land with potential for development was valued at from \$1,000 to \$10,000 per acre; land with little development potential was valued at from \$200 to \$500 per acre. Land values also varied from site to site based on the proximity to developed areas and highways; development taking place in the area; and suitability for development. Land needed for the dam, spillway and design high water pool was included in the land acquisition cost.

Cost estimates are presented on the basis of a cost per-acre-foot of storage and cost per surface acre to provide a comparison between different sites and different levels of development at the same site. Costs are based on preliminary estimates; firm cost estimates for any site can be determined only after completion of detailed geologic and engineering investigations, final structural designs, and land appraisals.

No cost estimates are included for existing reservoirs.

REPORT CONTENTS

This report is divided into sections based on the eleven subwatersheds in the Nashua Study Area. A location map, placed after the "Table of Contents," outlines the area covered by each subwatershed. To aid local residents in determining which sites are located in their city or town, Appendix 1 contains a listing of municipalities within the study area and an index of the potential and existing sites and page numbers pertaining to that city or town.

Each subwatershed section provides "Site Data" for the potential and existing reservoir sites located within the subwatershed.

Potential Reservoir Sites

These site data include a location paragraph which contains a narrative description of the location of the site in reference to nearby roads, railroads, or other physical landmarks. In addition, the latitude, longitude and USGS quadrangle sheet name are provided to enable more accurate location.

Man-made facilities that would be flooded by a reservoir at the potential site are presented in the Facilities Affected paragraph of the site data. Several elevations were selected to cover the range of development which appear practical at the site. For each elevation, an inventory of the affected facilities is provided which indicates all of the improvements that would be flooded if the design high water from the reservoir were at the specified elevation. The elevation of existing facilities was estimated during the engineer's field reconnaissance with the aid of the USGS quadrangle sheets. The extent of road flooding was scaled from the quadrangle sheets. If the engineer assumed that a road would be closed, rather than relocated by the reservoir, the road is listed, but no length is indicated.

A summary of the preliminary geologic report is contained in the Geologic Conditions paragraph. The material in the abutments (the valley sides) and the foundation (the valley floor) is described. An estimate is made of the depth to bedrock and the probable type of rock. The availability of impervious fill material which would be used in the dam construction is noted.

Possible leakage problems are indicated and the waterholding capability of the site is subjectively described as "good," "fair," or "poor." The waterholding capability statement is based on the geologist's interpretation of the surficial conditions he has observed during the field reconnaissance.

Engineering Notes provide information which should be helpful in preliminary design of a dam. One of the abutments is recommended as the location for an excavated emergency spillway. The excavated spillway might be in earth or rock cut -- depending upon the depth to bedrock in the abutment. If an excavated emergency spillway is unable to carry the required flows at safe velocity, the need for a concrete emergency spillway is noted. If waterholding capability can be significantly improved with a practical cutoff through pervious abutment or foundation material, this fact is noted.

When it is known that some portion of a reservoir site is located on land owned by a governmental or quasi-public unit, the information is presented in a <u>Public Ownership</u> paragraph.

Some sites which did not meet all of the study criteria (usually because of drainage areas less than 0.5 square miles or extensive development) have been included in the report to present whatever limited information that may have been obtained and the reason that the potential site was eliminated from further study.

Potential sites which meet study criteria have been analyzed using a computer program which develops preliminary structure designs for several levels of beneficial pool. Results of the computer program are presented in the tables entitled Summary Data for Potential Upstream Reservoir Sites at the end of each subwatershed section. Two information lines contain data on site drainage area, USGS quadrangle name on which the site is located, latitude and longitude of the site, site rating, stream water quality, and principal spillway design storm runoff and peak flow. The site rating is based on the expected waterholding capability, existing facilities affected, geologic conditions, and stage-storage relationships. Sites are given one of the following ratings:

- 1. Suitable for deep permanent storage (over 10 feet in depth).
- 2. Best suited for shallow water storage (3 to 5 foot maximum depth).
- 3. Best suited for temporary storage (e.g., floodwater and sediment storage.

In order to furnish the most data for each potential reservoir site, each site was considered to be suitable for deep permanent storage (rating "l") for purposes of design and analyses. The rating for any site could change based on detailed geologic investigations.

Stream water quality ratings are based on classifications assigned by the Division of Water Pollution Control, Massachusetts Water Resources Commission, and published in Water Quality Standards, June 1967, and are as follows:

- "Class A -- Waters designated for use as public water supplied in accordance with Chapter 111 of the General Laws. Character uniformly excellent.
- "Class B -- Suitable for bathing and recreational purposes including water contact sports. Acceptable for public water supply with appropriate treatment.

 Suitable for agricultural, and certain industrial cooling and process uses; excellent fish and wildlife habitat; excellent aesthetic value.
- "Class C -- Suitable for recreational boating; habitat for wildlife and common food and game fishes indigenous to the region; certain industrial cooling and process uses; under some conditions acceptable for public water supply with appropriate treatment. Suitable for irrigation of crops used for consumption after cooking. Good aesthetic value.
- "Class D -- Suitable for aesthetic enjoyment, power, navigation, and certain industrial cooling and process uses. Class "D" waters will be assigned only where a higher water use class cannot be attained after all appropriate waste treatment methods are utilized."

The Summary Data for Potential Upstream Reservoir Sites tables also contain data for as many as six possible levels of development at each site. Elevations of the beneficial pool, emergency spillway crest, design high water, and top of dam are shown, along with pertinent storage volumes, surface areas and depths. Total cost expressed in dollars per acre foot of storage and dollars per surface acre are provided to aid in comparison of levels of development. The emergency spillway type which was used in the preliminary design is indicated by an emergency spillway type code and explained in the table notes.

These tables are photo-reductions of the computer output sheets. Elevations are shown to the tenth of a foot and costs to the nearest \$10.00, but are not to be considered that accurate because of the limited investigations made with preliminary data. All the Summary Data Tables are based on preliminary reconnaissance-type investigations and computer-produced structure designs. Additional detailed engineering, geologic and design investigations must be made before final site selection, land acquisition and final design would be practical.

Estimated safe yields for each potential reservoir are also shown on the tables and were based on information extrapolated from data developed by Professor G. R. Higgins, Civil Engineering Department, University of Mass., Amherst, Mass. These estimated safe yields are based on a 95% chance, or the minimum yield that could be expected 19 years out of 20 -- taking into consideration reservoir storage volume and expected runoff. These data do not consider evaporation, seepage, or prior upstream usage losses.

The Committee on Rainfall and Yield of Drainage Areas of the New England Water Works Association has recommended a figure of 600,000 gallons per day per square mile as a maximum economically feasible safe yield. Data for some of the potential sites in this report show a safe yield above 600,000 gallons per square mile per day; these higher values are useful to define the upper portion of a discharge-storage curve for preliminary analysis. For detailed evaluation of a potential site for water supply purposes, the recommendation of the New England Water Works Association should be considered.

Existing Reservoirs

Site data for existing reservoir sites are presented in a different format from the potential reservoir site data.

Location is indicated by reference to nearby roads, railroads or other physical landmarks. The appropriate USGS quadrangle sheet is indicated.

Physical data (surface area, height of dam, and drainage area) were estimated from the quadrangle sheet and by field reconnaissance.

Potential for Expansion of the existing reservoir is estimated and any major man-made facilities which would be affected by an enlarged reservoir are noted. In some instances, the drainage area of the reservoir does not meet the criteria requiring a 10 to 1 drainage area to pool area ratio, below which there may be relatively high evaporation losses. An increase in reservoir surface area might increase evaporation losses to a point where the reservoir could not be main-tained during the summer months. These situations are indicated by the statement "Small drainage area may limit further expansion."

A description of the dam and any spillway system is included in the Remarks paragraph. Construction materials, spillway type and size, and condition of the structures are noted.

<u>Public Ownership</u> of the reservoir is noted, if applicable. Appendix 2 contains a list of existing sites and available information concerning apparent ownership and use of the reservoir.

Some existing reservoirs which did not meet the study criteria (10 acre minimum surface area and a man-made dam) have been included in the report to present whatever limited information that may have been obtained and the reason the site was eliminated from further study.

MAPS

Individual subwatershed maps appear at the end of each section which indicate the location of the potential and existing reservoir sites in that subwatershed. The maps are reductions of mosaics prepared from 7½ minute USGS quadrangle sheets (1" = 2000' scale). The quadrangle sheets used and published dates are listed on the maps. Potential sites which met study criteria and which have information in the tables are indicated with a solid blue rectangle surrounding the site number. The maximum beneficial pool (from the Structure Data Tables) is indicated by a large blue wave pattern. The drainage area which flows into these sites is indicated by green shading.

Potential sites for which complete data were not developed are identified by a dashed blue rectangle surrounding the site number. Only the center line of these sites is indicated. These are sites with drainage areas of less than 0.5 square miles or which flood extensive facilities. The sites were dropped from further study when it was determined that they did not meet study criteria.

Existing reservoir sites are identified by a blue diamond surrounding the site number and a small blue wave pattern over the existing surface area.

NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-01, Souhegan River

The Massachusetts portion of the Souhegan River Watershed covers about 5,600 acres in the Towns of Ashburnham (Worcester County) and Ashby (Middlesex County).

The river originates in Massachusetts and flows northeasterly to Wilton, New Hampshire where it turns and flows nearly due east to its confluence with the Merrimack River. The Souhegan subwatershed was included in the Nashua Study Area, rather than the Merrimack, in an effort to maintain Study Areas as contiguous groupings of subwatersheds. Elevations in Massachusetts range from a high of about 1850 feet at Mount Wetatic to about 950 feet in the northern floodplain areas. Geology of the subwatershed could be characterized as schistose bedrock overlain from 10 to 25 feet of glacial till or englacial drift.

Nine potential reservoir sites and four existing reservoirs were studied. Summary tables are included for eight potential sites that met study criteria.

SITE NA-0101

Location:

On South Brook approximately 600 feet southwest of the junction of Route 119 and Flint Street in Ashby, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42⁰41'02" Longitude: 71⁰51'46"

Facilities Affected:

Below Elevation 1100

13 houses

2 trailers

21 cottages

1 small business

14 miscellaneous buildings

525 feet of Rindge Road

1325 feet of Fitchburg Road Old Ashby Road

Below Elevation 1095

4 houses

Old Ashby Road

Below Elevation 1090

2 houses

Old Ashby Road

Below Elevation 1080

1 house

Old Ashby Road

SITE NA-OlOl (Cont'd)

Geologic Conditions:

Both abutments are schistose bedrock overlain by thin discontinuous englacial drift -- shallow to bedrock. Depth to bedrock in foundation not known, but may be within 5-10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete chute spillway may also be needed at this site to avoid excessive velocity in the excavated spillway.

SITE NA-0102

Location:

On South Brook approximately 350 feet upstream from the Massachusetts-New Hampshire boundary in Ashby, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°42'33"

Longitude: 71°51'09"

Facilities
Affected:

Below Elevation 1040

8 houses

1 Townshed Complex

400 feet of Jewett Hill Road

1100 feet of Breed Road

2000 feet of West Road

Jones Hill Road

Below Elevation 1035

8 houses

l Townshed Complex 1400 feet of West Road Jones Hill Road

Below Elevation 1030

2 houses

750 feet of West Road Jones Hill Road

Below Elevation 1015 100 feet of West Road Jones Hill Road

Below Elevation 1005

900 feet of Jones Hill Road

Below Elevation 990

200 feet of Jones Hill Road

SITE NA-0102 (Contid)

Geologic Conditions:

Right abutment consists of floodplain deposits at lower elevations and glacial till or englacial drift on higher elevations - shallow to bedrock. Depth to schist bedrock in foundation not known, but probably 15-25 feet. There are leakage problems in both abutments and foundation. Impervious berrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear fair.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made. Preliminary designs indicate that a concrete emergency spillway (either a chute or monolithic conduit) will be required to avoid excessive velocity on the excavated emergency spillway.

Public Ownership:

About 20 acres are on Boy Scout Camp land.

SITE NA-0103

Location:

On an unnamed tributary to South Brook approximately 1200 feet upstream from West Road in Ashby, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle Latitude: 42°42'28" Longitude: 71°51'54"

Facilities Affected:

Below Elevation 1070
2 houses
1 garage
1600 feet of Bennett Road
1500 feet of Pillsbury Road

Below Elevation 1065

l garage 1500 feet of Bennett Road Below Elevation 1060
1 house
1360 feet of Bennett
Road

Below Elevation 1050 300 feet of Bennett Road

SITE NA-OlO3 (Cont'd)

Geologic Conditions:

Right abutment is outwash sand and gravel - shallow to bedrock or glacial till. Left abutment is englacial drift with cobbles and boulders - shallow to bedrock. Depth to schist bedrock in foundation not known, but may be 15-25 feet. There are leakage problems in both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Water-holding capabilities may be improved if a positive cutoff can be made.

SITE NA-OlO4

Location

On an unnamed tributary to Ward Pond at junction of Old Ashby Road and Marble Road in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quad. Latitude: 42°40'31" Longitude: 71°53'02"

Facilities Affected:

Below Elevation 1125
2 houses
1100 feet of Ashby Road
1500 feet of Old Ashby Road

Below Elevation 1120 450 feet of Ashby Road 1500 feet of Old Ashby Road

Geologic Conditions:

Both abutments are outwash sand and gravel and silty sand and gravel. Right abutment is glacial till at higher elevation. Depth to bedrock in foundation is not known. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction is available on site; however, there are some cobbles and boulders present. Waterholding capabilities appear fair to poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made.

Public Ownership:

A small area north of Old Marble Road is in the Ashburham State Forest.

SITE NA-0105

Location:

On an unnamed tributary to Marble Pond near junction of Rindge Turnpike and Wagg Road in Ashburnham, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle Latitude: 42°40'09" Longitude: 71°52'16"

Facilities Affected:

Below Elevation 1220
1200 feet of Fitchburg Road
Wagg Road
Private Road

Below Elevation 1205 500 feet of Fitchburg Road

Geologic Conditions:

Both abutments are silty sand and gravel, shallow to schist bedrock. Depth to bedrock in foundation not known, but may be 10-15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be good.

Engineering Notes:

The emergency spillway will probably be in schist in bedrock.

SITE NA-0106

Location:

On tributary to Stodge Meadow Pond approximately 300 feet upstream from road which runs along East Bank of pond in Ashburnham, Massachusetts

Ashburnham, Massachusetts Quadrangle

Latitude: 42°41'02" Longitude: 71°51'46"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (189 acres); therefore, no further investigations were made.

SITE NA-OlO7

Location:

On South Brook approximately 350 feet upstream from Jones Hill Road in Ashby, Massachusetts

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°42'11" Longitude: 71°51'12"

Facilities Affected:

Below Elevation 1040

8 houses
Town Garages
2 houses
750 feet of West Road
2000 feet of West Road
1111 feet of Breed Road
Houses
Below Elevation 1030
Below

Below Elevation 1035
8 houses
Town Garages
1400 feet of West Road

Geologic Conditions:

The right abutment is floodplain deposits at lower elevations and glacial till on higher elevations - shallow to bedrock. Left abutment is ice contact sand and gravel - shallow to bedrock. Depth to bedrock in foundation not known, but may be schist at 15-25 feet. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 30 percent. Waterholding capabilities appear to be fair.

Engineering Notes:

Waterholding capabilities may be improved if a positive cutoff can be made. The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs, indicate that a concrete emergency spillway (either a chute or monelithic conduit) will be required to avoid excessive velocity in an excavated spillway.

Public Ownership:

About 5 acres are on Boy Scout Camp land

SITE NA-0108

Location:

On an unnamed tributary to South Brook approximately 2500 feet upstream from Bennett Road in Ashby, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quadrangle.

Latitude:

42°42'19" Longitude: 71°53'01"

Facilities Affected:

No facilities affected below Elevation 1230.

Geologic Conditions:

The right abutment is glacial till near the toe of slope, underlain by schist bedrock. There is bedrock higher on the abutment. The left abutment is silty sand, glacial till. Depth to bedrock in foundation is not known, but may be 15-25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment.

SITE NA-0109

Location:

On an unnamed tributary to Ward Pond approximately 350 feet upstream from Route 101 (Ashby Road) in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quadrangle. 42°41°02" Longitude: 71°53°09" Latitude:

Facilities Affected:

No facilities affected below Elevation 1165.

Geologic Conditions:

Both abutments are englacial drift sand and gravel with cobbles and boulders. Depth to bedrock not known, but probably schistose at 10-15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 30 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

A very small area is in the Ashburnham State Forest.

NA-OllO -- MARBLE POND

Location:

North of Stodge Meadow Pond in

Ashburnham, Massachusetts

Ashburnham, Massachusetts Quadrangle

Surface Area (Acres)

Height of Dam (Ft.)

Drainage Area
(Acres) (Sq. Mi.)
1080 1.69

Potential for

Expansion:

It appears that the pond could be raised about 15 feet to the level of Stodge

Meadow Pond with a new dam.

Remarks:

This is an old stone mill dam with a building over the structure. Stone work is in poor condition.



NA-Olll -- WARD POND

Location:

Upstream of Rindge Turnpike in Ashburnham,

Massachusetts.

Ashburnham, Massachusetts Quadrangle

Surface Area (Acres)

Drainage Areas (Acres)

(Sq. Mi.)

49

2390

3.73

Remarks:

Ward Pond appears to be a natural depression rather than a man-made pond. No photographs were taken.

NA-Oll2 -- STODGE MEADOW POND

Location:

Near Hay Road in Ashburnham, Massachusetts

Ashburnham, Massachusetts Quadrangle.

Surface Area (Acres)

126

Drainage Areas (Acres)

570

0.88

(Sq. Mi.

Remarks:

Stodge Meadow Pond has no dam. No photos

were taken.

NA-Oll3 -- WATATIC POND

Location:

On the Ashby-Ashburnham town line near Route 119

Ashby, Massachusetts Quadrangle.

Surface Area (Acres)

Drainage Areas (Acres)

(Sq. Mi.)

21

2630

4.10

Remarks:

Watatic Pond has no dam. No photos were taken.

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	BENEF	BENEFICIAL POOL	301	BENEFICIAL POOL * EMERGENCY SPILLWAY * DESIGN *		#	EMERGENCY	CY SPIL	SPILLWAY	*	DESIGN	IGN	*	DAM	-	*	SAFE
						**				*	* HIGH MATER	MATER	*			*	YIELD
******	中,一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个	*******	中华安安安安	李本本 李本本	· · · · · · · · · · · · · · · · · · ·	非非非非非非	非非由非非由	非非非非非非非	*****	*****	*****	*****	*****	中华市市中土	非非非非非 非		AT 95
		COST		COST/	DEPTH,	* CREST	2	STORAGE	2	COST #			* TOP	•	FI	FILL *P	
ELEV	STORAGE	PER	AREA	SURF	AT	* ELEV		AT CREST		PER *	ELEV	AREA	" * ELEV		HGT VOL		*CHANCE
		AC FT		AC	DAM	#+ TYPE	100		AC	FT #			*			g	,
(MSL)	AC FT IN	(\$)	(AC)	(\$)	(FT)	* (MSL)) AC	FT	Z	* (\$)	(MSL)	(AC)	*	(MSL)	FT	* (λ)	(MGD)
*****	· 在中央中央中央中央中央中央中央中央中央中央中央中央中央中央中央中央中央中央中央	中华市市市市市市	- 李章章章	京事事事事亦亦	· · · · · · · · · · · · · · · · · · ·	李安安安安安	安安安安安安	*****	******	****	****	*****	****	*****	*****	******	*****
NA-0101		DA= 4.	4.70 SQ MI =	# IW	3008 AC	USGS	S QUAD	QUAD- ASHBY MASS-NH	MASS-	INI		LATITU	IDE 42-	-41-02	LATITUDE 42-41-02 LONGITUDE	TUDE 7	71-51-46
SITE R	RATING (1)	STRE	STREAM WATER	ER QUALITY	ITY (8)	100-YR	- 2	SPWY	SPWY DESIGN	STORM	RUND	FF =	8-20 IN.	IN. PE	PEAK FLOW		830 CFS
										專			*			*	
1064.0	0.0		00		7.0	* 1093.0	-	1040 4	4.1	1490 *	1097.3	3 212	*	1099.9	43	186 *	***
1072.6	100 0.4	13020	15	88070	15.6	* 1072.6	T 9	138 0	9.5	* 0956	1085.6	77 9	*	1088.8	32	92 #	0.36
1079.4	216 0.8	7230	20	79230	22.4	# 1079.4	1 4	254 1		* 0919		3 154	*	1097.5	41	162 *	0.62
1086.4	449 1.7		48	33420	29.4	* 1086.4	7 4.			3270 *		4 174	*	1097.8	41	165 #	0.99
1092.3	914 3.5		115	15300	35.3	* 1092°3	,3 T			1850 *		8 222	101	1100.0	43	187 *	1.52
1092.5	941 3.8		119			# 1092.5	7 5			1790 *			*	1099.9	43	187 *	1.55
非非非命非非非	· 南洋 医多种		*****	中田中中中中中	車車車市市車車	****	李章李章	*	中華水車市市	李字亦亦字字	****	****	****	****	****		*
NA-0102		DA= AC	8-70 SO MT	H	SSKR AC	1186	MALIO	HN-COUNTY ACHRY MACCHIN	MACC	12		ATITI	1 AT ITHINE 42-434	-42-33	IONGITIOE	Ί	71-51-00
SITER	SITE RATING (2)	STRFA	M WATE	ALIAI	TY (B)	100-YR	PRIN	PRIN SPWY DESIGN STORM	FSTGN	STORM	RUND	H	8-20	IN. PE	8-20 IN PEAK FLOW	100	1537 CFS
						排				*			*				
986.8	0.0		-		9°8	* 1021.8	ш	3136 6	6.8	300 *	1024-1	1 182	*	1031.1	54	# 96	****
991.1	100 0.2	11660	29	40770	14.2	* 991,		170 0		* 0889			*	1011.5	35	30 *	0.43
1002.4	671 1.4		75	17500	25.4	* 1002.4	1 4			1760 *		3 140	*	1020.1	43	53 *	1.60
1013.5	1812 3.9	890	131	12420	36.5	* 1013.5	 	1881 4	4.1	* 098	1028.4	4 201	*	1033.9	57	109 *	2.95
1024.4	3524 7.6	550	183	10550	47.4	# 1024.4	 - -	3593 7	7.6	540 #	1034.9	9 263	*	1039.9	63	141 *	4.28
1032.5	5199 11.2	430	237	9520	55.5	# 1032.5	⊢	5269 11	11.3	430 *	1037.1	1 289	*	1040.0	63	142 *	5.18
非非非非非非非	市市中央市场市场市场市场市场市场市场市场市场市场市场市场市场市场市场市场市场市场	中非非非非非非非	中华华华中中	非非非非非非非	李 李 华 李 李 李 李 李		*****	*********************************	中非非非非中	****	*****	*****	非非非非非非非非非非非非非非非		*	***********	事 申 申 申 申 中
NA-0103	OATTMC (2)	DA= 2.	TECH MATER ONA	# 5	1280 AC	USGS	S QUAD-	-ASHBY	MASS-N	NH OCT 2	CMIIG	LATITU	DE 42-	LATITUDE 42-42-28	-) u	ITUDE	71-51-5
						*		5	10101			1	*	1		*	17 77
1037.6	0.0		10		2.5	* 1049.6	9 E	443 4	4.1 2	2080 *	1052.0	0 76	*	1054.9	20	23 *	****
1042.6	100 0.8	0996	31	31030	7.6	* 1049.1	1	419 3	3.9 2	2300 *		47 9	*	1053.9	19	21 *	0.28
1050.5	488 4.6	2170	99	15510	_	* 1053.0	• 0 E	691 6		1540 *	1055.4	4 92	*	1057.5	23	30 *	0.74
1057.3	1069 10.0	1130	101	11960		* 1059.8	w	7	12.7	# 068	1062.3	3 134	*	1064.6	30	58 *	1,13
1062.4	1651 15.5	870	135	10670	27.4	# 1064.9	ш		19.1	710 *		1 176	*	1069.8	35	* 56	1.39
1062.5			136		27.5	* 1065.0	ш		19.2	* 002	1		*	1070.0	35	* 96	1.39
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NOTES -	_		0 0N 19	BASED ON 1971 S.C.S.		Descrip		AND COST DATA.		•							
	(2) EMERGENCY	ICY SPILLWAY	- 1	STORAGE AND	IND COST	•	BASED	ON TOTAL	1	RAGE	STORAGE, INCLUDING BENEFICIAL	ING BE	NEFIC	IAL POOL.	76.		
	(3) EMERGENCY	ICY SPILLWAY	WAY TY	TYPE CODE-	NO3=3 -		CHUTE,	CHUTE, D=CONCRETE DROP,	RETE L		E=EXCAVATED, T= TWO	VATED,	T= T	40 SPII	SPILLWAYS,	N= NC	NONE
	(4) TABULAR	TABULAR DATA ARE BASED ON PRELIMINARY IN	E BASE	ED ON PI	RELIMINA	RY INF	RMATI	FORMATION. FIGURES	SURES	SHOWN	ARE PR	IMARIL	Y FOR	COMPA	ARE PRIMARILY FOR COMPARISON PURPOSES	URPOSE	S
	(5) ELEVATIONS	ONS ARE	SHOWN	ARE SHOWN TO THE	NEAREST 0.1	0.1 F	OT TOC	FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO	VARIAT!	10N BE	TWEEN	DEVELO	PHENT	S ONLY,	AND A	ARE NOT	TO BE
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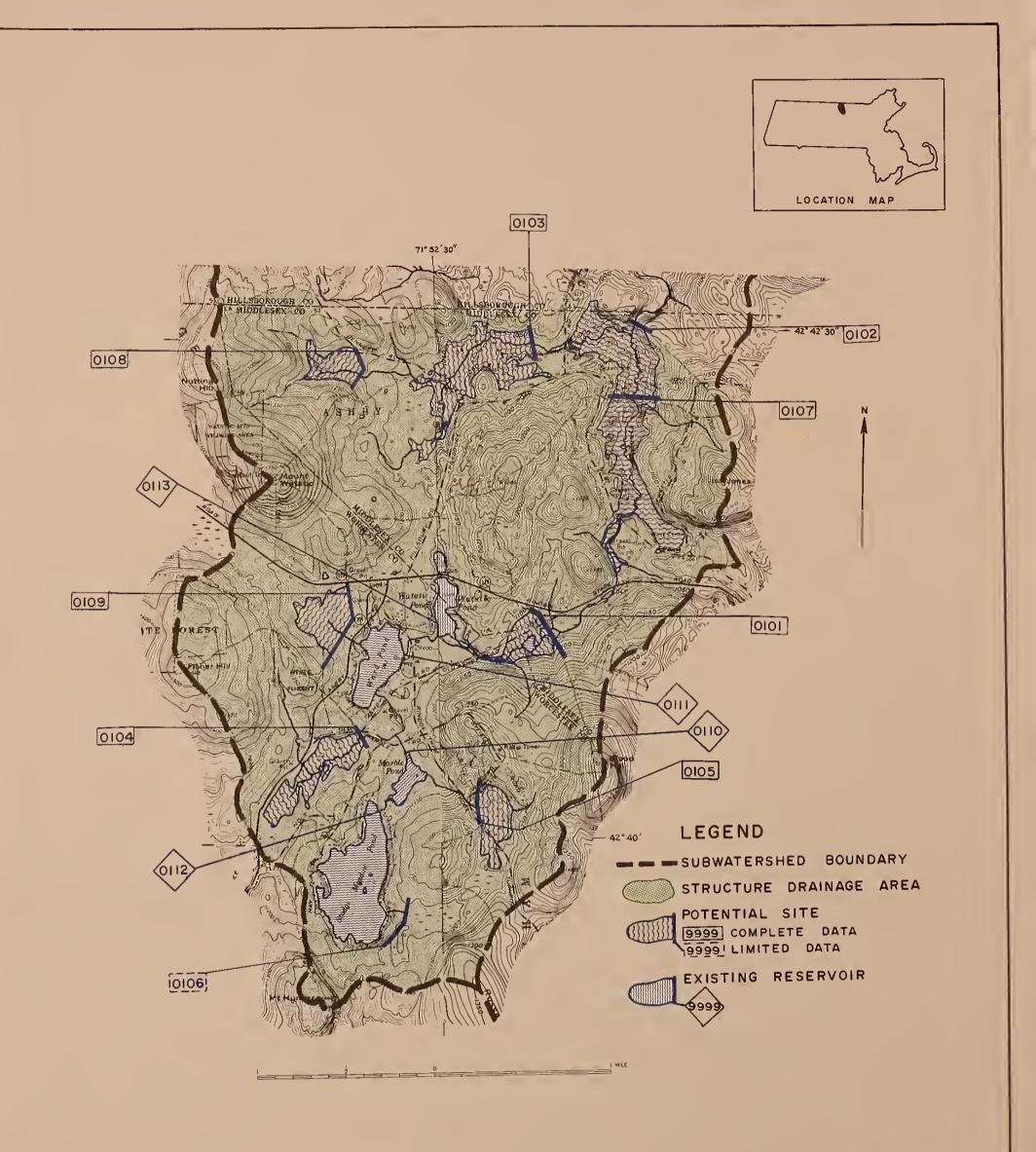
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	BEI	VEFIC	BENEFICIAL PUUL	_			*	EMERG	EMERGENCY SPILLWAY	ILLMAY		*	DESIGN		*	DAM		*	SAFE	
							*					* H	* HIGH WATER		*			*	YIELD	
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75.10	20000		1 500	4 1 0 4	71803	DEPTH	- 1	4ES	STURAGE		CUST				* TOP				*PERCENT	ال
. ברבא	SIUKAGE		AC FT	AKEA	AC	DAM	* ELEV	* ELEV *+ TYPE	AI CRESI	-	AC FT		ELEV A	AKEA .	* ELEV	E E		0	*CHANCE	
(MSL)	AC FT	N.	(\$)	(AC)	(\$)	(FT)	*	* (MSL)	AC FT	N I	(\$)	* (MSL)	121) (AC)	(AC) * (MSL)) FT		CY) *	* (MGD)	
*****	· · · · · · · · · · · · · · · · · · ·	* * * *	****	***	****	****	***	****	****	****	****	****	*****	***	****	****	****	****	***	*
SITE	RATING (3)		UA= U./ STREAM	CEAM WATER	- QUALI	448 AC TY (B)		USGS QU.	USGS QUAD- ASHBURNHAM MASS-NH 100-YR PRIN SPWY DESIGN STORM R	DESIG	N STO	S-NH	RUNDFF	TITUDE = 8.	20 IN	LATITUDE 42-40-31 LONGITUDE 71-53-02 DFF = 8.20 IN, PEAK FLOM = 124 GFS	FLOWGI	TUDE 7	71-53-0 124 CFS	02
							*					*		•				*		
1103.1				9		1.1	*	- 1		4.1	11010	7	* 1111.9	- 1	* 1114.6		13	*	****	
1108.1			17440	6	53150	6.1	*		202	5.4	8630	* 11	1113.0	55	11115.3		13	* 6	0.18	
1112.1		7.1	6770	21	35120	10.2	*	- 1	416	11.1	4340	*	1116.8	7	1119.9	İ	18	17 *	0.33	
1116.3		13.7	3610	69	27110	14.2	*		206	18.9	2640	*		85	1123.1		21	24 *	0.46	
1120.6		1.77	2300	8	22420	18.6	*	1123.1 E	1089	29.5	1800			102	1126.6		25	34 *	0.56	
11/10/	733 C2.U	_ :	2120	76	21580	19.5	1		4971	51.0	0/91	-	1124.6	901	* 1127.4	4.	25	36 *	0.58	1
			0.50	O SO MI	# #	320 AC			TO DIAD-ACHRY MACCINE THE TRANSPORT OF A TITIDE 42-40-40-40-40-40-40-40-40-40-40-40-40-40-	HN-SSW A	INI		TAI	TTIDE	42-6	ATTITUE 42-40-10-10-10-10-10-10-10-10-10-10-10-10-10	JONG	TIIDE 7	71-52-16	* 4
	RATING (1)		STREAM	WATE	DUALI	Y (B)		J-YR PR	100-YR PRIN SPWY DESIGN STORM	DESIG	STO		RUNDFF	8	20 IN	8-20 IN. PEAK FLOW	FICH		88 CFS) V
1							*													
1193.4		0.0		4		1.4	* 12	1201.3 E	111	4.1	3820	* 12	1203.6	28 •	* 1206.4		14	* 6	****	
1201.0	100	3.8	4730	31	21120	9.0	• •	1203.5 E	167	6.1	2840		1205.8	33 +	* 1208.1 * 1212.0		16	12 +	0.17	
1208.0		11.6	1950	37	16180	16.0	*	5	1	15.5	1460	+ 12	1212.6	47	1215.6		24	35 *	0.30	
1211.8	465 17	17.4	1430	45	14650	19.7	*	1214.3 E	589	22.1	1130	*	1215.9	55 4	1218.8		27	# 65	0.36	
1212.5	496 18		1370	47	14470	20.5	+ 17		625	23.4	1090	* 17	1090 * 1216.5	26 #	* 1219.3	.3	27	53 *	0.37	
7010-41	***		*****	***	* * *	****	***		*	****	***	**	*****	***	****	***	***	*****	***	* *
NA-0107	101 JULIA		UA= 6.30 SU M		# 2	4032 AC		USGS GUAD-		DECTO	COLY DESTEN STORM		LAI	TIODE	LAIIIUUE 42-42-11		-11 LONGITUDE	JUDE	71-51-12	71
			SINCAL	2			*	2		0534	210		1		1				97	
992.8				13		5.8	*	1031.5 E	2169	6.5	830	*	1033.9	139 *	* 1038.9		52	268 *	****	
0.666		0.3	13250	21	63890	12.0	*	0	150	0.4	8810	*	1010.0		* 1012.5			24 *	0.39	
1012.0		1.7	2950	54	32460	25.0	*	0	648	1.9	2720	*		- 1	* 1030*3			176 *	1,33	
1023.5		4.0	1700	80	28520	36.5	*	1023.5 T	1394	4.1	1640	*						276 *	2.17	
1032.5	0 6477	0	1030	121	18230	45.5	* *		5677	8.0	1010	*	1037.8		* 1039-9		23	* 087	78.7	
******* NOTES -	**************************************	COSTS ARE	BASED ON	***** 0N 19	BASED ON 1971 S.C.S.	. DES	DESIGN CR			DST DA	DATA.		AND COST DATA.	***		****	* * * * * * * * * * * * * * * * * * * *	*	* * *	*
	1	EMERGENCY			TYPE CODE- C=CONCRETE	C=C01	NCRE			ACRETE	DR.OP.		EXCAVATED. T= TWO SPILLMAYS.	FD. 1	THE	SPILL	WAYS.	H	NON	
		LAR D	TA ARE	BASE	TABULAR DATA ARE BASED ON PRELIMINARY INF	LIMIN	ARY		FORMATION. FIGURES	GURES	SHOWN		ARE PRIMARILY FOR COMPARISON PURPOSES.	RILY	FOR C	OMP AR I	SON P	URPOSE	2	
	(5) ELEV	ELEVATIONS	ACCUR	HOWN	ARE SHOWN TO THE N	NEAREST	T 0.1	1 F00T	FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY,	VARIA	TION	SETWE	EN DEV	ELOPA	HENTS	ONLY,	AND A	ARE NOT	NOT TO BE	ш
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######################################	######################################	######################################	######################################	##************************************	***** A T 95 LL *PERCENT L *CHANCE 0.00 * (CY) * (MGD) ************************************
######################################	**************************************	#*************************************	AREA * ELEV * TOP * TOP * TOP * (AC) * (MSL) ************************************	HGT VOL (1000) FT CV FT CV FT CV FT CV FT CV FEAK FLOM = 39 59 250 50 330 74 477 76 50 76 50	** AT 95 ** AT 95 **CHANCE ** (MGD) ** ** ** ** ** ** ** ** ** ** ** ** **
COST COST COST COST ELEV STORAGE PER AREA SURF AT # ELEV (MSL) AC FT AC DAM *+ TY (MSL) AC FT IN (\$) (AC) (\$) (FT) # (MSL) AC FT IN (\$) (AC) (\$) (FT) # (MSL) AC FT IN (\$) (AC) (\$) (FT) # (MSL) AC FT IN (\$) (AC) (\$) (FT) # (MSL) AC FT IN (\$) (AC) (\$) (\$) (FT) # (MSL) AC FT IN (\$) (AC) (\$) (\$) (FT) # (MSL) AC FT IN (\$) (AC) (\$) (\$) (AC)	ST STORAGE VPE SL) AC FT IN ***********************************	COST * ELEV AC FT * ELEV (\$) * (MSL) ************************************	* TOP AREA * ELEV (AC) * (MSL) ***********************************	HGT VOL (1000) FT CY (1000) 19 LONGITU PEAK FLOM = 39 8 51 17 59 25 66 33 74 47 74 47 76 50	*CHANCE *CHANCE * (MGD) ************************************
ELEV STORAGE PER AREA SURF AT # ELE (MSL) AC FT IN (\$) (AC) (\$) (FT) # (MI ***********************************	FV AT CREST SL) AC FT IN ***********************************	PER * ELEV (\$) * (MSL) ************************************	AREA * ELEV * (AC) * (MSL) ************************************	HGT VOL (1000) FT CY ************************************	*CHANCE * (MGD) ************************************
MSL	SL) AC FT IN ************************************	AC FT * (MSL) ***********************************	(AC) * (MSL) *********** (TITUDE 42-42- = 8.20 IN, 9 * 1190.1 20 * 1202.1 22 * 1209.8 27 * 1216.6 34 * 1225.1 36 * 1227.3	FT CY ************************************	* (MGD) ************************************
(MSL) AC FT IN (\$) (AC) (\$) (FT) * (MSL) ************************************	SL) AC FT IN ************************************	(\$) * (MSL) ************************************	(AC) * (MSL) ***********************************	FT CY 19 LONGITUL 24 FLOM = 39 8 51 17(59 25(66 33(74 47) 76 50 76 50	* (MGD) ********** 106 GES * * * * * * * * * * * * * * * * * * *
NA-0108	SGS QUAD-ASHBURN-YR PRIN SPWY DES 35.3 E 133 4.1 98.1 E 288 9.0 15.6 E 437 13.6 12.1 E 587 18.4 20.1 E 813 25.4 20.1 E 812 25.4 22.4 E 892 27.9 ************************************	HAM MASS-NH LA 1GN STORM RUNDFF 3660 * 1187.8 2590 * 1200.6 2110 * 1222.6 1610 * 1222.6 1530 * 1224.8	TITUDE 42-42- * 8.20 IN* 9 * 1190.1 20 * 1202.8 22 * 1209.8 27 * 1216.6 34 * 1225.1 36 * 1227.3	29 8/2 51 170 59 250 66 330 74 477 76 50	106 GES 106 GES * * * * * * * * * * * * * * * * * * *
SITE RATING (1) STREAM WATER QUALITY (B) 100- 1157.6	-YR PRIN SPWY DES -YR PRIN SPWY DES 	16N STORM RUNDEF 3660 * 1187.8 2590 * 1200.6 2110 * 1208.0 1610 * 1222.6 1530 * 1224.8	# 8.20 IN,	29 8; 51 17(51 17(54 47; 74 47; 76 50;	106 GFS 106 GFS * ***** * 0.42 * 0.50
1157.6	35.3 E 133 4.1 98.1 E 288 9.0 15.6 E 437 13.6 12.1 E 587 18.4 20.1 E 813 25.4 22.4 E 892 27.9 ************************************	3660 * 1187.8 2590 * 1200.6 2110 * 1208.0 1850 * 1214.6 1610 * 1222.6 1530 * 1224.8	9 * 1190.1 20 * 1202.1 22 * 1209.8 27 * 1216.6 34 * 1225.1 36 * 1227.3	39 8; 51 17(59 25(66 33(74 47) 76 50°	* * * * * * * * * * * * * * * * * * *
1157.6	95.3 E 133 4.1 98.1 E 288 9.0 15.6 E 437 13.6 12.1 E 587 18.4 20.1 E 813 25.4 22.4 E 892 27.9 ************************************	3660 * 1187.8 2590 * 1200.6 2110 * 1208.0 1850 * 1214.6 1610 * 1222.6 1530 * 1224.8	9 * 1190°1 20 * 1202°1 22 * 1209°8 27 * 1216°6 34 * 1225°1 36 * 1227°3	39 8 51 17(59 25(66 33(74 47) 76 47)	* 0.29 * 0.37 * 0.42 * 0.42 * 0.42 * 0.50
1195.6 240 7.5 3120 15 48260 44.7 * 11.0 1203.1 380 11.8 2420 21 44330 52.0 * 12.0 12.0 12.0 12.0 13.0 11.8 2420 21 44330 52.0 * 12.0 12.0 12.0 16.2 2.0 90 22 49350 58.6 * 12.0 12.0 12.0 13.0 22.7 1790 30 42970 66.6 * 12.0 12.0 12.0 17.0 33 41480 68.9 * 12.0 12.0 17.0 17.0 17.0 17.0 17.0 17.0 17.0 17	98.1 E 288 9.0 15.6 E 437 13.6 12.1 E 587 18.4 20.1 E 813 25.4 22.4 E 892 27.9 ************************************	2590 * 1200.6 2110 * 1208.0 1850 * 1214.6 1610 * 1222.6 1530 * 1224.8	20 * 1202.1 22 * 1209.8 27 * 1216.6 34 * 1225.1 36 * 1225.1	51 17(59 25(66 33(74 47) 76 50(0.29 0.37 0.42 0.48 0.50
1203.1 380 11.8 2420 21 44330 52.0 + 12(1209.6 520 16.2 2090 22 49350 58.6 + 12(1217.6 730 22.7 1790 30 42970 66.6 + 12(1219.9 800 25.0 1710 33 41480 68.9 + 12(1219.9 800 25.0 1710 33 41480 68.9 + 12(1219.9 800 25.0 1710 33 41480 68.9 + 12(1219.9 800 25.0 1710 33 41480 68.9 + 12(1219.9 800 25.0 1710 33 41480 68.9 + 12(1219.9 800 2.7 4440 15 30380 14.8 + 11(123.6 267 7.1 2.380 24 26620 23.6 + 11(123.6 517 13.7 17.2 33 27 27 50 33 2 4 11(13.6 517 13.7 17.2 33 27 27 51 51 51 51 51 51 51 51 51 51 51 51 51	12.1 E 587 18.4 20.1 E 587 18.4 20.1 E 813 25.4 22.4 E 892 27.9 ************************************	2110 * 1208.0 1850 * 1214.6 1610 * 1222.6 1530 * 1224.8 ************************************	22 * 1209a8 27 * 1216a6 34 * 1225a1 36 * 1227a3	59 256 66 338 74 47 76 50	3 * 0.42 * 0.48 * 0.50
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Notes



SOURCE-USGS QUAD. SHEETS ASHBURNHAM-1965 ASHBY-1965 SOUHEGAN RIVER (NA-I)
NASHUA STUDY AREA
MASSACHUSETTS

EXISTING AND POTENTIAL RESERVOIR SITES

UNITED STATES DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE

USDA-SCS-HYATTSVILLE, ND 1978



NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-2, North Nashua River

This subwater shed covers about 36,500 acres in Ashburnham, Westminster, Gardner, Princeton, Leominster and Fitchburg; all in Worcester County.

The main stream is the Whitman River which forms in the hills of Ashburnham around Lake Wampanoag and flows southeasterly through Westminster to Snows Mill Pond in Fitchburg before it joins the North Nashua River. Elevations vary from about 1900 feet in the extreme northern and southern sections to about 500 feet in the downstream areas of Fitchburg. Geology within the subwatershed is predominantly schist bedrock at depths of 10 to 40 feet, overlain by glacial till or englacial drift.

Twenty seven potential reservoir sites and 17 existing reservoirs were studied. Summary tables are included for 17 potential sites that met study criteria.

SITE NA-0201

Location:

On a tributary to Hobbys Pond approximately 1400 feet east of Howe Hill in Gardner, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°36'03" Longitude: 71°58'27"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (223 acres) Therefore, no further investigations were made.

SITE NA-0202

Location:

On an unnamed tributary to South Ashburnham Reservoir, approximately 2800 feet upstream from Route 101 (Central Street), in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quadrangle Latitude: 42°37'49" Longitude: 71°55'48"

Facilities Affected:

No facilities affected below Elevation 1105

Geologic Conditions:

The left abutment is sand and gravel underlain by silty sand and gravel, glacial till. The right abutment is sand and gravel outwash, swamp and silty sand and gravel glacial till. Depth to bedrock in foundation is not known, but may be 15-25 feet to schist. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 20 percent. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a cutoff to till can be made.

SITE NA-0203

Location:

On Phillips Brook 500 feet upstream of Factory Village Pond in Ashburnham, Massachusetts

Ashburnham, Massachusetts-New Hampshire Quadrangle

Latitude: 42°37'44" Longitude: 71°53'44"

Facilities Affected:

No facilities affected below Elevation 960

Geologic Conditions:

The right abutment is silty sand and gravel englacial drift - shallow to schist bedrock. The left abutment is outwash sand and gravel. Depth to bedrock in foundation is not known, but may be 35 feet to schist bedrock. There is a leak-age problem in the left abutment in outwash terrace. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good if terrace on left abutment can be cut off.

SITE NA-0203 (Cont'd)

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete chute spillway will probably be required to avoid excessive velocity in an excavated emergency spillway.

SITE NA-0204

Location:

On Brown Brook approximately 4,000 feet upstream from Route 12 (Fitchburg Road) in Ashburnham, Massachusetts.

Ashburnham, Massachusetts-New Hampshire Quadrangle Latitude: 42°38'16" Longitude: 71°52'58"

Facilities Affected:

Below Elevation 1090

Below Elevation 1070

2 houses l house

l barn 1200 feet of Russell 2500 feet of Russell Hill Road Hill Road

Below Elevation 1080

Below Elevation 1065

2 houses 700 feet of Russell 1 barn Hill Road

1550 feet of Russell Hill Road

Geologic Conditions:

Both abutments are thin englacial drift underlain by schist bedrock. Depth to bedrock in foundation is not known, but may be 15 to 25 feet to schist. There are no apparent leakage problems, but there is a possible leakage problem in the low terrace on the right abutment. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0205

Location:

On unnamed tributary to Phillips Brook approximately 2,600 feet upstream from Dean Hill Road on Ashburnham-Westminster Town Boundary.

Ashby, Massachusetts-New Hampshire Quadrangle
Latitude: 42°37'30" Longitude: 71°52'08"

Facilities
Affected:

Below Elevation 1000
600 feet of unnamed road off Jewell Hill Road

Geologic Conditions:

Both abutments are silty sand and gravel, glacial till. There may be some englacial drift - shallow to schist bedrock on the right abutment. Depth to schist bedrock in foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0206

Location:

On Phillips Brock in Westminster, Massachusetts about 1900 feet downstream of Smith Road

Fitchburg, Massachusetts Quadrangle

Latitude: 42°36'08" Longitude: 71°52'00"

Remarks:

This is the Nookagee Site proposed in the Corps of Engineers North Nashua Study. For further information on this site see:
"Water Resource Development Plan -- North Nashua River Basin", U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965. Site topography, costs, etc., are presented in the appendices of the Corps report.

Location:

On a tributary to Phillips Brook approximately 1,250 feet upstream from Bean Hill Road in Westminster, Massachusetts

Fitchburg, Massachusetts Quadrangle

Latitude: 42°35'33" Longitude: 71°52'17"

Engineering Notes:

Drainage Area - 386 acres -- This site does not meet criteria for this study. At the maximum feasible pool elevation, the depth at the dam is less than 7 feet and storage is less than 100 acre-feet; therefore, no further investigations were made.

SITE NA-0208

Location:

On Phillips Brook in Fitchburg, Massachusetts, about 2,500 feet upstream of Westminster Hill Road.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°34'52"

Longitude: 71°50'52"

Remarks:

This is the Phillips Dam proposed in the Army Corps of Engineers North Nashua Study. For further information on this site see:
"Water Resource Development Plan - North Nashua River Basin", U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965.
Site topography, costs, etc. are presented in the Appendices to the Corps' report.

Location:

On an unnamed tributary to Whitman River approximately 900 feet upstream from Boston and Maine Railroad in Gardner, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°35'08" Longitude: 71°56'42"

Geologic Conditions:

Both abutments are silty sand, glacial till.

Depth to schist bedrock unknown, but may be 30 to 40 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains gravel and cobbles. Waterholding capabilities appear to be good.

Engineering Notes:

This site does not meet the criteria for this study. With maximum top of dam elevation at 1100 and maximum normal pool at 1090, there are less than 100 acre feet of storage and less than 7 feet of depth at the dam, therefore no design summaries were made.

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0210

Location:

On an unnamed tributary to Whitman River approximately 200 feet upstream from Overlook Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°34'18" Longitude: 71°55'20"

Facilities Affected:

Below Elevation 1040 1500 feet of Beech Hill Road Below Elevation 1025 200 feet of Beech Hill Road

Below Elevation 1035 550 feet of Beech Hill Road

SITE NA-0210 (Cont'd)

Geologic Conditions:

Both abutments are silty sand or gravel including the dike, and probably shallow to schist bedrock. Depth to schist bedrock in foundation is unknown, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 25 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0211

Location:

On a tributary to Whitman River approximately 3,200 feet from Ashburnham Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°35'21" Longitude: 71°53'30"

Engineering Notes:

This site does not meet criteria for this study due to the small contributing drainage area. (259 acres), therefore no further investigations were made.

SITE NA-0212

Location:

On Whitman River approximately 1900 feet upstream from junction of Ashburnham Road and Route 2A in Westminster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°33'43" Longitude: 71°52'25"

Facilities Affected:

No facilities affected below Elevation 700.

SITE NA-0212 (Cont'd)

Geologic Conditions:

The left abutment is thin sand and gravel underlain by dense glacial till. The right abutment is outwash sand and gravel. Depth to schist bedrock in foundation is not known, but may be 15 to 20 feet. There is a leakage problem in the right abutment. Impervious borrow material for dam construction is available on site; however rock greater than 6 inches may run 30 percent. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Water-holding capabilities may be improved if a positive cut-off can be made. No further investigations were made at this site. Storage potential is poor for the large structure drainage area.

SITE NA-0213

Location:

At outlet end of Burnt Mill Pond in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°32'50" Longitude: 71°55'58"

Facilities Affected:

Below Elevation 1110

11 houses
1 garage
1 shop
300 feet of Ellis Road

450 feet of Ellis Road

Geologic Conditions:

The left abutment is silty sand or gravel, glacial till. The right abutment is outwash sand and gravel. Depth to schist bedrock in foundation is not known, but may be 30 to 40 feet. There is a leakage problem in the right abutment. Impervious borrow material for dam construction is available on the left abutment, but will be rocky. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. See existing site data for Burnt Mill Pond; (page 29).

Public Ownership:

About 1% of the area is owned by the Massachusetts Department of Natural Resources.

NA-0213 -- BURNT MILL POND

Location:

1300 feet upstream of Route 140 in Westminster, Massachusetts.

Gardner, Massachusetts USGS Quadrangle

Surface Area (Acres)	Height of Dam (Ft.)	Drainage (Acres)	Area Sq. Mi.)	
20	6	710	1.12	

Potential for

Expansion:

This site has expansion potential if a new dam is constructed. See potential site

narrative and summary tables.

Remarks:

This is a low earth-fill dam with two concrete spillways. The dam has trees and brush growing along the top and downstream slope. Dam has very little freeboard and is in poor condition.

Location:

On a stream tributary to Wyman Pond approximately 200 feet upstream from Worcester Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°31'38" Longitude: 71°53'42"

Facilities Affected:

No facilities affected below Elevation 950

Geologic Conditions:

Both abutments are silty sand and gravel, glacial till. Depth to schist bedrock in the foundation is not known, but may be 10 to 15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 20 percent. Waterholding capabilities appear to be good.

Engineering

The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete emergency spillway (monolithic conduit) will probably be needed to avoid excessive velocity in an excavated emergency spillway.

SITE NA-0215

Location:

On a tributary to Wyman Pond approximately 2350 feet upstream from Worcester Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°31'05" Longitude: 71°54'02"

Engineering Notes:

This site does not meet criteria for this study due to the small contributing drainage area; (2h8 acres), therefore, no further investigations were made.

Location:

On a tributary to Wyman Pond approximately 1000 feet upstream from Bolton Road in Wachusett Mountain State Reservation, Westminster. Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°30'20" Longitude: 71°53'47"

Facilities Affected:

No facilities affected below Elevation 1110

Geologic Conditions:

Both abutments are silty sand and gravel glacial till and shallow to schist bedrock. Depth to bedrock in the foundation is not known, but probably 15 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 20 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway

is at the left abutment.

Public Ownership:

The entire site is within the Wachusett Mountain State Reservation.

SITE NA-0217

Location:

On Flag Brook approximately 150 feet downstream from Cody Road in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°32'07"

Longitude: 71°51'03"

Below Elevation 805

Facilities Affected:

Below Elevation 810

1 Barn 3500 feet of Fitchburg Road Cody Road

1 Barn Cody Road

Below Elevation 800 1 Barn Cody Road

Geologic Conditions:

The right abutment is outwash sand, mostly fine to medium, with some gravel. The left abutment is englacial drift and is shallow to granitic bedrock high on the abutment. Depth to granitic bedrock in foundation is not known, but may be 15 to 20 feet. There is a leakage problem in the right abutment and a possible leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear poor.

SITE NA-0217 Cont'd

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities can be improved if a positive cutoff can be made.

Public Ownership:

About 75% of the land is owned by the Massachusetts Department of Natural Resources.

SITE NA-0218

Location:

At upstream end of Hobby's Pond in Gardner, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°36'33" Longitude: 71°58'21"

Facilities Affected:

Below Elevation 1130 1000 feet of Raymond Road

Below Elevation 1120 850 feet of Raymond Road

Geologic
Conditions:

Both abutments are silty sand and gravel, englacial drift probably shallow to schist bedrock. Depth to schist bedrock in foundation is not known, but is probably shallow. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On an unnamed tributary to South Ashburnham Reservoir in South Ashburnham approximately 1250 feet upstream from Route 101 in Ashburnham, Massachusetts.

Ashburnham, Massachusetts - New Hampshire Quadrangle Latitude: 42°37'34" Longitude: 71°55'36"

Facilities Affected:

No facilities affected below Elevation 1090.

Geologic Conditions:

The left abutment is thin englacial drift sand and gravel underlain by dense till. The right abutment is silty sand, dense glacial till. Depth to schist bedrock in foundation is not known, but may be 15 to 25 feet. There is a leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 percent. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a cutoff can be made on the left abutment.

SITE NA-0220

Location:

On Phillips Brook approximately 250 feet upstream from Potato Hill Road in Westminster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°35'30" Longitude: 71°51'42"

Facilities Affected:

This site was eliminated from further study due to excessive facilities affected. (Route 12 and many houses)

Geologic Conditions:

The left abutment is englacial drift with a thin outwash sand and gravel at the surface. The right abutment is englacial drift, shallow to bedrock. Depth to bedrock in foundation is now known, but may be 15 to 20 feet. There is a leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 40 percent. Waterholding capabilities appear to be fair.

SITE NA-0220 (Cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff to till or bedrock can be made on the left abutment.

SITE NA-0221

Location:

On tributary to Whitman River approximately 2200 feet upstream from Ashburnham Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle.

Latitude: 42°35'10"

Longitude: 71°53'30"

Facilities Affected:

Below Elevation 970

Below Elevation 965

4 Powerline Towers

3 Powerline Towers

Below Elevation 950

Below Elevation 945

3 Powerline Towers

l Powerline Tower

Below Elevation 930

1 Powerline Tower

Geologic Conditions:

Both abutments are thin discontinuous englacial drift, silty sand with cobbles and boulders, shallow to bedrock (3 to 4 feet). There are schist outcrops in the foundation. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities can be improved if positive cutoff can be made.

Location:

On a tributary to Whitman River approximately 2000 feet upstream from East Gardner Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°34'33" Longitude: 71°54'47"

Facilities Affected:

Below Elevation 1015

250 feet of Overlook Road

Below Elevation 1005

50 feet of Overlook Road

Below Elevation 1010
100 feet of Overlook Road

Geologic Conditions:

Both abutments are silty sand or gravel with cobbles and boulders and clean gravel high on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems except high on the left abutment. Impervious borrow material for dam construction is available on-site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0223

Location:

On a tributary to Round Meadow Pond approximately 550 feet upstream from Town Farm Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°32'55" Longitude: 71°54'03"

Geologic Conditions:

Both abutments are silty sand or gravel, probably shallow to bedrock. Depth to schist bedrock in foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 20 percent. Waterholding capabilities appear good.

Remarks:

This site does not meet criteria for this study due to the size of the contributing drainage area, (less than 0.5 square miles), therefore, no design summary was made.

SITE NA-0223 (Cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. A sufficient quantity of borrow material is not available on site.

SITE NA-0224

Location:

At outlet end of marsh area approximately 700 feet upstream of Gardner Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°34'12"

Longitude: 71°54'29"

Facilities Affected:

No facilities affected below elevation 995.

Geologic Conditions:

Both abutments are silty sand or gravel with cobbles and boulders. Depth to schist bedrock not known, but may be 20 to 25 feet. There are no apparent leakage problems. Impervious borrow for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0225

Location:

On a tributary to reservoir in South Ashburnham approximately 500 feet upstream from Barrel Road in Ashburnham, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°36'25" Longitude: 71°54'10"

Facilities
Affected:

No facilities affected below elevation 1055.

SITE NA-0225 (Cont'd)

Geologic Conditions:

The right abutment is silty sand. Glacial till may be shallow to bedrock. The left abutment is thin englacial drift with outcrops of bedrock. Depth to schist bedrock is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

NA-0226 -- LAKE WAMPANOAG

Location:

On the Whitman River in South Ashburnham, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°36'59" Longitude: 71°57'25"

Surface Area	Height of Dam	Drainage Area	
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
268	25	1860	2.90

Potential

for

Expansion:

Expansion potential is limited by size of the pool area in relation to drainage area. Evaporation losses would increase as the pool area increased.

Remarks:

This is an earth fill dam with a concrete weir spillway about 40 feet wide and 6 feet deep. The upstream face is rock riprapped.

The dam and spillway are in good condition except for a few small trees at the

downstream toe.

NA-0227 -- SOUTH ASHBURNHAM RESERVOIR

Location:

On the Whitman River, 4500 feet upstream of Whitmanville, Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42⁰35'32"

Longitude: 71°54'38"

Surface Area
(Acres)

Height of Dam (Ft.)

Drainage Area (Acres) (Sq. Mi.)

116

Potential

25

8000 12.49

for

Expansion:

Some expansion is possible, but South Ashburnham Road would be affected by any major enlargement of the reservoir.

Remarks:

This is an earth dam with a modified concrete chute spillway at the right abutment. Spillway weir is about 40 feet wide with about 6 feet of freeboard. There are trees on the downstream slope of the dam, but the earthfill and spillway appear to be in good condition.

Geologic Conditions:

The right abutment is outwash sand and gravel, but may be shallow to schist bedrock. The left abutment is thin englacial drift, silty sand and gravel. There are schist bedrock outcrops in the foundation. There is a possible leakage problem in the right abutment. Impervious borrow material for dam construction possibly is available on the left abutment. Waterholding capabilities appear good.



Location:

On a tributary to Phillips Brook approximately 2000 feet upstream from Ashburnham Street in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°35'17" Longitude: 71°50'34"

Facilities Affected:

No facilities affected below elevation 860.

Geologic Conditions:

Both abutments are schist bedrock with thin discontinuous englacial drift at the surface. Depth to bedrock in foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0229

Location:

On a tributary to Whitman River between two branches of the Boston and Maine Railroad and approximately 3500 feet northeast of watertowers at the State Hospital in Gardner, Massachusetts.

Gardner, Massachusetts Quadrangle

Latitude: 42°35'19" Longitude: 71°56'09"

Facilities Affected:

No facilities affected below elevation 1060.

Geologic Conditions:

Both abutments are silty sand, glacial till.

Depth to schist bedrock not known, but may be 25 to 30 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

NA-0230 -- MEETINGHOUSE POND

Location:

Near Academy Hill in Westminster, Massachusetts

Gardner, Massachusetts Quadrangle.

Latitude: 42°32'03" Longitude: 71°54'20"

Surface Area
(Acres)

Height of Dam (Ft.)

Drainage Area (Sq. Mi.) (Acres)

158

15

1080 1.69

Potential for

Expansion:

It appears that the reservoir could be expanded, but watershed yield might be a limiting factor.

Remarks:

This reservoir is part of the Fitchburg Water Supply. The embankment of Princeton Road ties into the earth fill dam. Downstream face of Princeton Road fill is vertical with rock retaining wall. Upstream slope has been riprapped.

Dam abutments are rock ledge. Spillway is a concrete weir (30' wide) with flashboards. Total structure appears to be in good condition.



NA-0231 -- CROCKER POND

Location:

Near South Ashburnham Road, 7500 feet south of Whitmanville, Westminster, Massachusetts. Do not confuse with NA-0241 also called Crocker Pond.

Gardner, Massachusetts Quadrangle

Latitude: 42°34'08" Longitude: 71°52'53"

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
101	30	13560	21.19

Potential for Expansion:

South Ashburnham Road and railroad limit expansion. See Geologic Conditions.

Remarks:

Earthfill dam in good condition. Spillway is an ogee weir with about 100 foot length.

Geologic Conditions:

Both abutments are outwash sand or gravel. There are bedrock outcrops in the foundation. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor above present water level.



NA-0232 -- WACHUSETT LAKE

Location:

Near intersection of Worcester and Whitehouse Roads in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Surface Area Height of Drainage Area (Acres) Dam (Ft.) (Acres) (Sq. Mi.)

147 5 1030 1.61

Potential for

Expansion:

This reservoir could be expanded, but the small drainage area would probably limit yield.

Remarks:

Worcester Road forms the dam for this reservoir. The spillway is a stone culvert under the road. This lake is a part of the Fitchburg Water Supply.

Geologic Conditions:

Both abutments are sand and gravel, glacial outwash. Depth to schist bedrock in foundation not known, but may be 40 to 50 feet. There are leakage problems in both abutments. Imprevious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor above present water level.



NA-0233 -- WINNEKEAG LAKE

Location:

West of Route 101 about 7000 feet north of Ashburnham Center.

Ashburnham, Massachusetts Quadrangle

Surface Area
(Acres)
115

Height (Ft	of ;.)	Dam
	20	

Drainage	Area
(Acres)	(Sq. Mi.)
1440	2.25

Potential for Expansion:

Limited by cottages around the lake and Route 101.

Remarks:

This is an earthfill dam about 30 feet wide at top. Downstream slope is about 1/4 to 1 with placed stone face. Upstream slope is 3:1 with riprap. Spillway at the right abutment is a 30 foot wide concrete weir with provision for flashboards. Dam appears to be in good condition, but apparent seepage was noted at the vertical downstream face.

NA-0234 -- FACTORY VILLAGE POND

Location:

South of Main Street (Route 12) near Blackburn Village on the Ashburnham-Westminster town line.

Ashburnham, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage Area	
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
10	20	3190	4.99

Potential for Expansion:

Expansion would affect Route 12. Potential site NA-0203 about 1500 feet upstream seems more feasible.

Remarks:

This is an earth fill dam with stone downstream face. Spillway section has a 75 foot wide stone weir and a 10 foot wide concrete ogee section. There are large trees growing in the left side of the dam and quite a bit of seepage under the dam in the vicinity of two pipe spillways.

NA-0235 -- ROUND MEADOW POND

Location:

At the intersection of old Route 2 and 2A in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Surface Area	Height at	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
۲0	7	0010	1. ٢1.
58	(2910	4.54

Potential for Expansion:

Expansion is limited by roads on all sides.

Remarks:

This is a low earthfill dam with a 50 foot wide concrete weir spillway. Upstream face of dam is rock riprapped. There is some concrete spalling near the waterline at the weir sidewalls. Dam appears to be in good condition.



NA-0236 -- PARTRIDGE POND (Ellis Pond)

Location:

Upstream of Ellis Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage .	Area
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
28	6	360	0.56

Potential for Expansion:

This site does not have potential for significant expansion. Cottages are located all around the pond. Drainage area is small for this size pond.

Remarks:

Ellis Road is the dam for this pond. Spill-way is a 24-inch diameter pipe. There is only about 2 feet of freeboard between the normal water surface and Ellis Road; it appears that water does flow over the road during storms.

There are trees growing on the road side slopes. General condition of the dam is poor.

NA-0237 -- WYMAN POND

Location:

Upstream of East Road in Westminster, Massachusetts.

Gardner, Massachusetts Quadrangle.

Surface Area
(Acres)

Height of Dam (Ft.)

Drainage Area (Acres) (Sq. Mi.)

205

20

5010 7.83

Potential for

Expansion:

Limited by existing lakeside cottages.

Remarks:

This pond is a part of the Fitchburg Water Supply. Structure is an earth dam built in the late 1800's. Upstream slope of the dam is riprapped. Spillway has a 50 foot weir leading to a masonry chute spillway. Dam and spillway are in good condition.



NA-0238 -- SNOWS MILL POND

Location:

Waites Corner in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Surface Area (Acres)	Height of Dam (Ft.)	<u>Drainage</u> (Acres)	Area (Sq. Mi.)
26	15	18450	28.83

Potential

for

Expansion:

Limited by Westminster Road and the

Boston and Maine Railroad.

Remarks:

This is a mill pond with various intake structures to use the water. The main spillway has an overflow weir about 100 feet long. Structure appears in good condition.



NA-0239 -- SAWMILL POND

Location:

South of Route 2 in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Surface Area (Acres)	
63	

Height of Dam
(Ft.)
12

Drai	nage .	Area	444
(Acres		(Sq.	Mi.)
7600		11.8	 36

Potential

for

Expansion:

Limited by Routes 2 and 31.

Remarks:

This is a weir overflow dam with vertical stone face capped with concrete. Structure is in fairly good condition.

NA-0240 -- CROW HILL POND

Location:

East of Route 31 near intersection of Notown Road in Leominster, Massachusetts.

Fitchburg, Massachusetts Qudrangle.

Surface Area	Height of	<u>Drainage</u>	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
	7.0	,	2 (2
7	10	430	0.67

Potential for Expansion:

Leakage through sand and gravel may limit expansion. Drainage area is small.

Remarks:

This is an earthfill dam. Upstream face is riprapped. Spillway is a concrete drop structure with a 10 foot weir and 3 foot drop. Condition is good except for small trees and brush growing on slopes.



NA-0241 -- CROCKER POND

Location:

East of Route 31, about 3300 feet south of intersection of Route 31 and Notown Road in Westminster, Massachusetts. Do not confuse with NA-0231, also named Crocker Pond.

Fitchburg, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage A	rea
(Acres)	(Ft.)	(Acres) (Sq. Mi.)
10	15	180	0.28

Potential for Expansion:

Route 31 limits expansion. Site drainage area is rather small and limits expansion.

Remarks:

Fitchburg Road forms the dam for the lower portion of the pond. Spillway is a concrete drop structure about 5 feet wide with a two foot opening. Weir crest is about 5 feet from top of road. Structure is in good condition. A low earth-fill dam crosses this pond about 800 feet upstream of the spillway. The fill is about 8 feet high with a bituminous paved spillway over the fill. The spillway is in poor condition due to undermining and frost heaves. This structure also has a pipe drain through the fill.

NA-0242 -- MAC TAGGART'S POND

Location:

On Phillips Brook 500 feet upstream of Westminster Hill Road in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage Area	
(Acres)	(Ft.)	(Acres) (Sq.	Mi.
10	20	9810 15.	33

Potential for

Expansion:

Surface area could be nearly tripled without effecting any facilities.

Remarks:

This is a former mill dam. The dam is a large concrete weir structure about 20 feet high. Structure is in fair condition with some concrete spalling and seepage near the right abutment at the base of the concrete wall.

NA 0243 -- LINCOLN POND

Location:

About 1200 feet upstream of Stowell Road in Ashburnham, Massachusetts

Ashburnham, Massachusetts Quadrangle.

Surface Area	Draina	ge Area
(Acres)	(Acres)	(Sq.Mi.)
29	470	0.73

Remarks:

Lincoln Pond has no dam.

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E 209 3.5 1550 * 1090.5 78 * 1103.3 15 E 209 3.5 1550 * 1098.5 65 * 1100.3 12 E 574 9.8 830 * 1104.1 103 * 1107.0 19 E 1071 18.2 580 * 1108.0 131 * 1111.1 23 E 1700 29.0 430 * 1111.9 159 * 1114.9 27 E 1854 31.5 400 * 1112.6 166 * 1115.6 28 ************************************	*
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	EMERGENCY SPILLMAY TYPE CODE- C=CONCRET
E CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPORTOOT TO SHOW -VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE N	DR FINAL SITE SELECTION OR LAND ACQUISITION.

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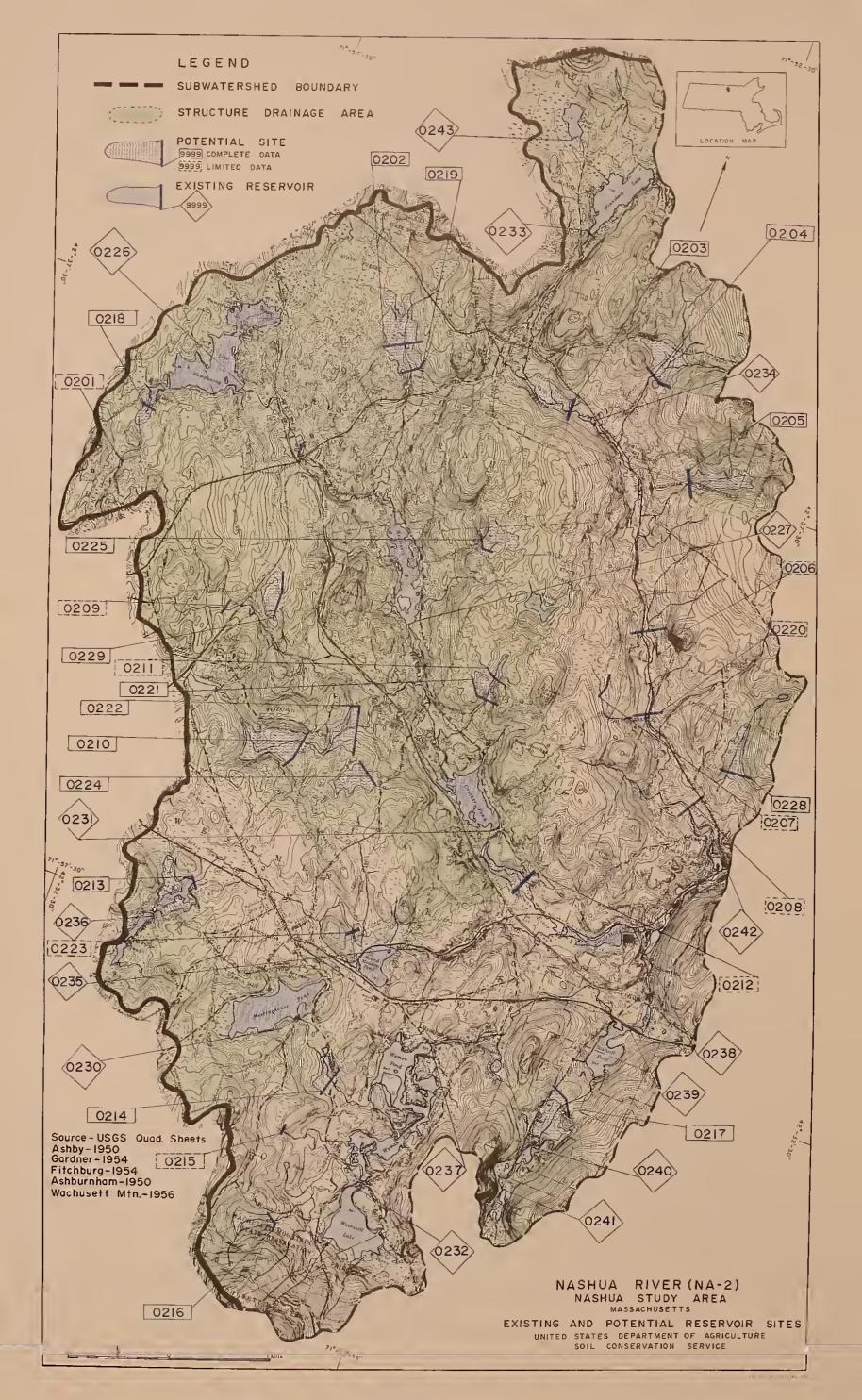
STORAGE PER AREA SUBF AT SELEY STORAGE COST SELEY AREA SELEY HOT UOLO AC FT IN (5) (AC) 15) (FT) (FT) (AC) AC FT IN (5) (HSL) (AC) (HSL) FT (100 AC FT IN (5) (AC) 15) (FT) (FT) (AC) AC FT IN (5) (HSL) (AC) (HSL) FT (100 AC FT IN (5) (AC) 15) (FT) (FT) (AC) AC FT IN (5) (HSL) (AC) (HSL) FT (100 AC FT IN (5) (AC) 15) (FT) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 15) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM RNORF SELEY HOT UOLO AC FT IN (5) (AC) 100-YR PRIN SPW DESIGN STORM STO		BENE	BENEFICIAL POOL	700			* EME	RGENCY	EMERGENCY SPILLWAY	>	* DE	DESIGN	*	DAM		* SAFE	
STORAGE PER AREA SURF AT SELEY AT CRST STORAGE COST	1										* HIGH	MATER	*			* YIELD	
STORAGE PER AREA SURF AT CREST PER ELEV AREA ELEV HGT 1000			COST		COST	DEPTH		STOR	AGE	COST	*	**	*************	****		*** AT 95	, <u>+</u>
AC FT IN 457 14C) 452 158 15 10 10 -78 PRIN SPK DESIGN SIRM RUNDFF = 8.20 IN. PEAK FLOH = 100 0.8 8 6.280 18 34550 15.8 9.29.9 1 118 1.0 3.34.9 3.0 9.44.8 2 0. 9.36.8 2 3 47 112 100 0.8 8 6.280 18 34550 15.8 9.39.4 1 18 1.0 3.34.9 3.0 9.44.8 2 0. 9.36.8 2 3 47 112 100 0.8 8 6.280 18 34550 15.8 9.34.5 1 2 0. 9.44.8 2 0. 9.44.8 2 3 47 112 100 0.8 8 9.44.8 2 0. 9.44.8 2 3 47 112 100 0.8 9.41.5 2 0. 9.41.5 2 0. 9.44.8 2 3 47 112 100 0.8 9.41.5 2 0. 9.41.5 2 0. 9.44.8 2 3 47 112 100 0.8 9.41.5 2 0. 9.41.5 2 0. 9.44.8 2 3 47 112 100 0.8 9.41.5 2 0. 9.41.5 2 0. 9.44.8 3 112 112 112 112 112 112 112 112 112 1	ELEV	STORAGE	PER	AREA	SURF		* ELEV	AT C	REST	1			*	>		1	,,,
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DATE DATE DATE LONG MI 1 LONG MI SPAN DISTIGN STREAM WATER QUALITY (B) LONG PARIN SPAN DISTIGN SPAN	*******	*********	*******	*****	本本本本本本本			*****	*****	******	#######	*****	*****	L / F F	****	(WCD) * (*
100 0.8 6280 18 34550 15.8 * 929.9 T 118 1.0 5340 * 934.8 20 * 936.8 23 47 16 16 1.4 4110 20 34900 19.2 * 993.1 T 183 1.6 3770 * 938.1 2 1 * 940.1 2 6 63 30 182 32 2.0 3230 21 36030 22.6 * 934.5 T 249 2.0 3000 * 941.5 24 * 943.5 30 82 31 2 2 2 2 2 2 36900 2 2.0 941.5 T 249 2.0 3000 * 941.5 24 * 943.5 30 82 31 2 2 2 2 2 2 2 2 2 36900 2 2.0 941.5 T 383 3.3 2260 * 947.4 30 * 949.4 3 112 2 2 2 3 3 3 3 3 3 3 3 3 3 2 2 2 2	NA-0214 SITE R	ATING (1)	DA= 2	-20 SQ	9494		USGS 100-YR	QUAD- G	ARDNER NY DEST	MASS GN STOR	M	LATIT	NDE 42-	-31-38	LONGITUE	JE 71-53-	42
100 0.6 6.280 18 34550 15.8 9.29.9 7 118 1.0 5340 934.8 20 936.8 23 475 20 63 23 23 23 23 23 23 23													*				1
166 1,4 4 10 20 34900 19,2 # 993,5 1 183 1,6 370 # 994,1 2 4 940,1 2 6 6 6 6 6 6 6 6 6	929.9	0			34550	15.8	* 929.9	-					*			*	٦
237 2.6 2540 23 36090 22.6 9 94.0 1 26.6 30.0 0 944.5 24 9 948.0 34 1122 366 3.0 22.6 350 27.0 23.0 22.6 942.5 1 383 3.3 26.0 394.0 1 32 36 3.0 25.0 34970 28.5 9 942.0 1 38 3.2 260 947.4 30 948.0 34 1122 366 3.0 25.0 270 27.0 28.5 942.5 1 383 3.3 2.6 947.4 30 9 948.0 34 1122 36 3.0 25.0 270 27.0 28.5 942.5 1 383 3.3 2.2 260 947.4 30 9 948.0 34 1122 36 371 2 36 370 2 2 34970 28.5 9100.0 6.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2	933.1				34900	19.2	* 933.1	-		3720	# 938		*			*	
331 2.8 2540 23 36090 27.0 8 941.0 T 348 3.0 2410 8 946.0 29 8 948.0 34 112 366 3.0 2310 25 34970 28.5 8 942.0 T 348 3.0 2410 8 947.4 30 8 949.4 35 122 312 312 312 3.0 2310 25 34970 28.5 8 942.5 T 383 3.3 2260 8 947.4 30 8 949.4 35 122 312 312 312 312 312 312 312 312 312	936.5				36030	22.6	* 936.5			3000	# 941	And department of the second	*		İ	*	
RATING (1) STREAM MATER QUALITY (A) 100-YR PRIN SPHY DESIGN STORM RUNGF = 8.20 IN. PEAK FLON = 2.60 Sq. MI = 384 AC USGS QUAD—GARDNER MASS 0 0.0 0.0 2.0 2 20750 25.0 1070.1 E 133 4.1 2640 1072.6 20 1075.1 26 26 24 450 17.5 1 200 25.0 1075.1 25 24 44 1000 3.0 3760 16 23090 18.6 1071.1 E 150 4.6 210 0 103.5 20 1075.1 25 24 44 1000 25.0 1075.0 22 20750 25.7 10708.3 E 1990 10.5 1080.3 3 3 1091.8 42 78 12.0 12.0 12.0 10.0 3.0 190.0 35 1890 41.0 1093.5 E 755 23.6 880 1095.8 33 1091.8 42 78 12.0 12.0 12.0 10.0 12.0 12.0 12.0 12.0	941.0				34970		46 96	 - -					* *			* *	
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DA= 0.60 SQ MI = 384 AC	*******	*******	*******	*****	******	******	******	*****	******	*****	*****	*****	*****	******	******	******	* * *
STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNGFF = 8.20 IN. PEAK FLON = 26	VA-0216		DA = 0	.60 SQ	MI =	384 AC	nses	QUAD- G	ARDNER	MASS		LATIT	UDE 42-	30-20	LONG I TU	DE 71-53-	-47
0 0.0 0 2.0 12 0	SITE R	ATING (1)	STRE	AM WATE	- 1		X.	PRIN SP	WY DEST	GN STOR		- 1	8.20	N. PEAK	FLOW =		S
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100 3.0 3760 16 23090 18.6 * 1071.1 E 150 4.6 2510 * 1073.5 20 * 1075.1 25 24 4 4 4 1080.3 3 1400.4 25 1080.3 3 1408.6 25 * 1082.6 33 44 4 78 4 450 14.1 1240 28 19640 34.4 * 1086.9 E 529 16.5 1050 * 1089.3 33 * 1091.8 42 78 1071.8 60 20.6 1000 35 18990 41.0 * 1093.5 E 755 23.6 880 * 1095.8 39 * 1098.3 48 112 4 8 100.2 5.0 910 38 18960 44.8 * 1097.3 E 904 28.2 810 * 1099.8 43 * 1102.6 53 138 112 4 8 102.6 1000 25.0 910 38 18960 44.8 * 1097.3 E 904 28.2 810 * 1099.8 43 * 1102.6 53 138 138 4 8 112 4	1055.0					5.0	* 1070.1			2640	* 1072		*			*	
440 (6.5) 1870 22 20750 25.7 * 1078.3 E 301 9.3 1490 * 1080.6 25 * 1082.6 33 44 4 4 4 4 6 6 20.6 10.0 28 19640 3.4.4 * 1086.9 E 529 16.5 1050 * 1089.3 33 * 1091.8 4 2 78 4 6 6 20.6 10.0 38 18960 41.0 * 1093.5 E 755 23.6 810 * 1099.8 43 * 1102.6 53 138 4 100.2 5.0 910 38 18960 44.8 * 1097.3 E 904 28.2 810 * 1099.8 43 * 1102.6 53 138 4 100.2 5.0 910 38 18960 44.8 * 1097.3 E 904 28.2 810 * 1099.8 43 * 1102.6 53 138 4 1091.2 6 10.0 25.0 910 38 18960 44.8 * 1097.3 E 904 28.2 810 * 1099.8 43 * 1102.6 53 138 4 1091.2 6 10.0 2.0 23 * 10.0 25.0 910 38 18960 44.8 * * * * * * * * * * * * * * * * * * *	1068.6				23090	18.6	* 1071.1			2510	# 1073		*			*	m
450 14-1 1240 28 19640 34-4 * 1086-9 E 529 16-5 1050 * 1088-3 33 * 1091-8 42 78 660 20-6 1000 25-0 910 38 18960 44-8 * 1093-5 E 755 23-6 880 * 1095-8 39 * 1098-8 3 48 112 48 112 48 100 25-0 910 38 18960 44-8 * 1093-5 E 755 23-6 880 * 1095-8 43 * 1102-6 53 138 138 138 138 138 138 138 138 138 13	8°6/01	ľ			20750	25.7	* 1078.3	ш		1490	# 1080		*			*	
000 20.0 41.0 41.0 41.0 41.0 41.0 41.0 41.0 4	1084-4				19640	34.4	* 1086.9	шı					*		•	*	0
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DA= 1.20 SQ MI = 768 AC USGS QUAD- FITCHBURG MASS LATITUDE 42-32-07 LONGITUDE STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.20 IN. PEAK FLOW = 1.00		800 25	910	38	18960	44.8	* 1097.3	E 90	4 28.2	810	* 1099	. 8	3 * 11(12.6	3 13	8 * 0.50	<u>.</u>
RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNGFF = 8.20 IN. PEAK FLOW = 8.41 COLOR STORM RUNGFF = 8.20 IN. PEAK FLOW = 8.20 IN. PIREL ININARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOS			DA-	20.00	MT .	740 AF		O VIII	TTCUDIES	SA SA SA	***		C 7 1011	20 02			* 0
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0 0.0 0 0.0 0 4 4.0 + 788.2 E 266 4.1 2010 + 790.5 60 + 793.4 20 23 * * * * * * * * * * * * * * * * * *							*				*		*			*	
3 100 1.6 5140 29 17530 11.3 * 786.8 E 198 3.0 2590 * 789.2 55 * 790.9 18 18 * 0.2 8 400 6.3 1670 60 11090 17.7 * 793.3 E 565 8.8 1180 * 795.7 70 * 798.0 25 39 * 0.5 5 850 13.2 1080 73 12470 24.6 * 800.0 E 1049 16.4 870 * 802.5 87 * 805.2 32 82 * 0.5 2 1300 20.2 880 89 12850 30.2 * 805.7 E 1541 24.1 740 * 808.0 106 * 811.3 38 133 * 0.5 4 1600 25.0 770 100 12330 33.4 * 808.9 E 1871 29.2 660 * 811.0 117 * 814.8 42 170 * 1.0 8 12850 0 12330 33.4 * 808.9 E 1871 29.2 660 * 811.0 117 * 814.8 42 170 * 1.0 8 1 1.0 CSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLMAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLMAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	177.0			4		4.0	* 788.2	ш		2010	* 790		*			*	
8 400 6.3 1670 60 11090 17.7 * 793.3 E 565 8.8 1180 * 795.7 70 * 798.0 25 39 * 0.5 5 850 13.2 1080 73 12470 24.6 * 800.0 E 1049 16.4 870 * 802.5 87 * 805.2 32 82 * 0.7 2 1300 20.2 880 89 12850 30.2 * 805.7 E 1541 24.1 740 * 808.0 106 * 811.3 38 133 * 0.8 4 1600 25.0 770 100 12330 33.4 * 808.9 E 1871 29.2 660 * 811.0 117 * 814.8 42 170 * 1.0 8 1600 25.0 770 100 12330 33.4 * 808.9 E 1871 29.2 660 * 811.0 117 * 814.8 42 170 * 1.0 8 1.0 CSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. 8 1.0 CSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. 8 2.0 CSTLLMAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. 8 2.0 CSTLLMAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	784.3				17530	11.3	* 786.8						*			*	~
5 850 13.2 1080 73 12470 24.6 * 800.0 E 1049 16.4 870 * 802.5 87 * 805.2 32 82 * 0.7 2 1300 20.2 880 89 12850 30.2 * 805.7 E 1541 24.1 740 * 808.0 106 * 811.3 38 133 * 0.8 4.2 170 1.0 20.2 880 89 12850 33.4 * 808.9 E 1871 29.2 660 * 811.0 117 * 814.8 42 170 * 1.0 2.4 * 805.2 32 82 * 0.8 4.2 170 * 1.0 2.4 * 800 25.0 770 1.0 12330 33.4 * * * * * * * * * * * * * * * * * * *	8.06/	- 1			11090	17.7	* 793.3	w		1180	* 795	-	*			*	
2 1300 20.2 880 89 12850 30.2 * 805.7 E 1541 24.1 740 * 808.0 106 * 811.3 38 133 * 0.9 4 1600 25.0 770 100 12330 33.4.* 808.9 E 1871 29.2 660 * 811.0 117 * 814.8 42 170 * 1.0 ***********************************	197.5				12470	24.6	* 800.0	ш.		870	* 802		*			*	_
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- (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE- C*CONCRETE CHUTE, D*CONCRETE DROP, E*EXCAVATED, T* TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.		1600 25.(770	100	12330	33.4	808 *	E 187	1 29.2	099	* 811	.0 11	7 * 81	4.8 4	2 17(0 * 1 00	
EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. EMERGENCY SPILLWAY TYPE CODE— C*CONCRETE CHUTE, D*CONCRETE DROP, E*EXCAVATED, T* TWO SPILLWAYS, N= NONE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	NOTES -	(1) COSTS A	IRE BASE	0 ON 19	71 S.C.	S. DESI	GN CRITE	RIA AND	COST D	ATA.							
EMERGENCY SPILLWAY TYPE CODE— C*CONCRETE CHUTE, D*CONCRETE DROP, E*EXCAVATED, T* TWO SPILLWAYS, N= NONE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.					ORAGE A	ND COST	- 1		TOTAL S	TORAGE,	INCLU	DING B	ENEFIC	AL POOL	•		
TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.			ICY SPIL	LWAY TY	PE CODE	- C*CON		UTE, D=	CONCRET	E DROP.		AVATED	1 = 1	O SPILL	WAYS, N	= NONE	
		۱ ا	S DATA A	RE BASE	D ON PR	EL IMINA	RY INFOR	MATION.	FIGURE	S SHOWN	ARE P	RIMARI	LY FOR	COMPARI	SON PUR	POSES.	

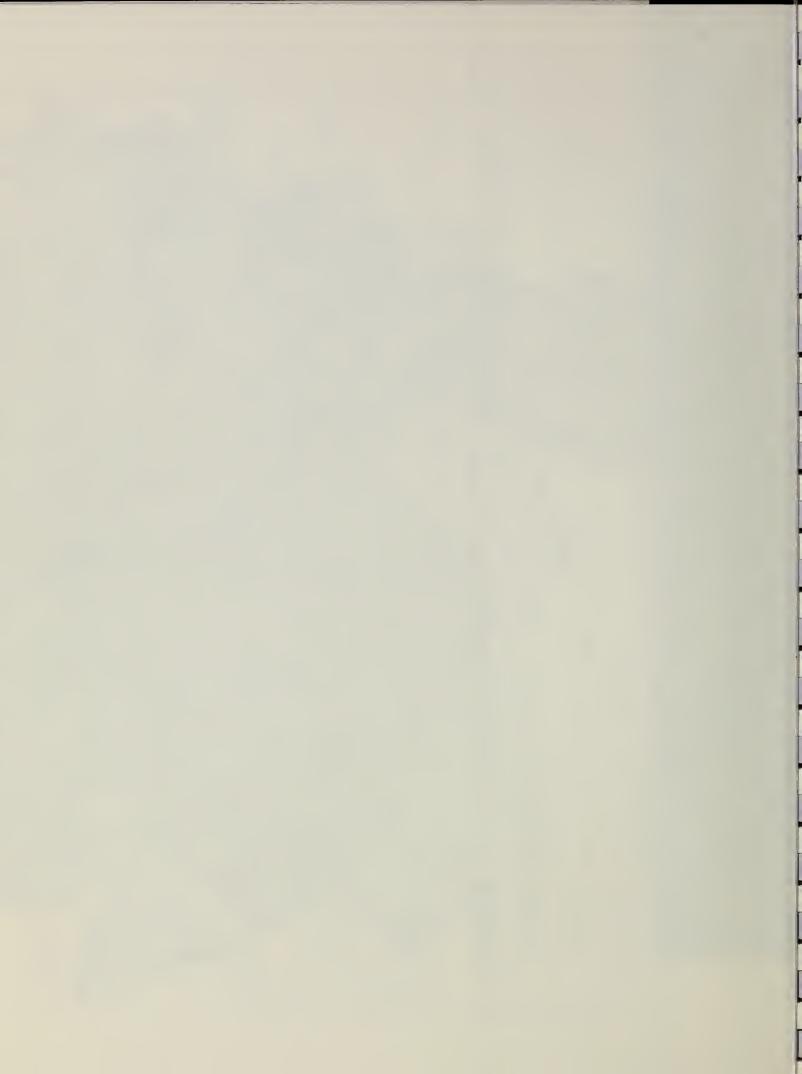
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· · · · · · · · · · · · · · · · · · ·		YIELD	AT 95	*PERCENT	CHANCE	(MGD)		71-58-21	141 CFS		***	0.20		0.50		· · · · · · · · · · · · · · · · · · ·	71-55-36	230 CES	****				96.0	1.08	电影电影中的,我们是一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个一个	71-53-30	200	****	0.18	0.29	0.40	0.48	0.50			ONE	19	NOT TO BE
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*****	DAM		****	HCT		FT	****		PEAK FL		30	23	37	39		****		PEAK FLOW	48	3.8	49	65	11	11	****	- 2	1	35	33	44	55	65	99		POOL.	PILLWAY	PARISON	LY, AND
******			*****	בוני		(MSL)	*****	LATITUDE 42-36-33	8.20 IN. PEAK FLOW		1120-8	1120-1	1127.6	1129.6		*****	LATITUDE 42-37-34	B.ZO IN.	1062.6	1053.1	1063.6	1074.4	1085.5	* 1091.6	****	LATITUDE 42-35-10 LONGIT		937.5	936.3	946.6	958.0	967.6	969.1	****	INCLUDING BENEFICIAL POOL.	E=EXCAVATED, T= TWO SPILLWAYS,	ARE PRIMARILY FOR COMPARISON	ENTS ON
*****		ATER *	****	ADEA		(AC) * (MSL)	******	TIT	#	*	- 1	# 0 7	85 *	# 66	•	*****	ATITUDE	11	* 26 *	15.	31 +	63 *	* 56	109 *		LIT		14 *	14 *	19 *	31 *	45 *	# 25	****	MG BENE	ATED, T	MARILY	EVELOPM
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NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-3, North Nashua River

The subwatershed covers about 26,600 acres in Ashby-Middlesex County, and Fitchburg, Leominster, Lunenburg and Westminster in Worcester County. The North Nashua River flows southeaterly through the watershed from Fitchburg to Leominster.

The main streams are Monoosnoc Brook which originates in the hills above Notown Reservoir and flows easterly through Leominster to the North Nashua River; and Falulah Brook which originates in the north western corner of Fitchburg and flows southeasterly to Leominster where it joins the North Nashua River. Elevations range from a high of about 1410 on Jewell Hill to about 290 in Leominster. Geology within the subwatershed is characterized by schist bedrock at depths of 10 to 50 feet, overlain by glacial till or englacial drift.

Sixteen potential reservoir sites and ll existing reservoirs were studied. Design summaries are included for six potential sites that meet study criteria.

SITE NA-0301

Location:

On a tributary to Falulah Brook approximately 2400 feet upstream from Ashby West Road in Fitchburg, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle.

Latitude: 42°38'04" Longitude: 71°50'44"

Facilities Affected:

No facilities affected below elevation 1025.

Geologic Conditions:

Both abutments are silty sand and gravel, thin and discontinuous, with schist bedrock outcrops. Depth to schist bedrock in foundation, not know, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On a tributary to Falulah Brook approximately 2900 feet upstream from Ashby West Road in Fitchburg, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°37'43" Longitude: 71°50'50"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area (147 acres), therefore, no further investigations were made.

SITE NA-0303

Location:

On Falulah Brook in Fitchburg, Massachusetts. 800 feet downstream of Ashby West Road.

Ashby, Massachusetts Quadrangle

Latitude: 42°37'53" Longitude: 71°50'05"

Remarks:

This is the Shattuck Dam proposed in the Army Corps of Engineers North Nashua Study. For further information on this site see:
"Water Resource Development Plan - North Nashua River Basin," U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965.

Site topography, costs, etc., are presented in the Appendices to the Corps, report.

Location:

On a tributary to Green's Pond approximately 4100 feet upstream from Billings Road in Fitchburg, Massachusetts.

Ashby, Massachusetts-New Hampshire Quadrangle

Latitude: 42°37'54" Longitude: 71°48'13"

Facilities Affected:

No facilities affected below elevation 825.

Geologic Conditions:

Both abutments are silty sand and gravel, glacial till, and probably shallow to schist bedrock. There may be a small sand and gravel terrace at the toe of the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems except possibly in the gravel terrace at the toe of the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run to 20 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0305

Location:

On tributary to Saima Pond and Falulah Brook in Fitchburg, Massachusetts. 1000 feet southwest of the intersection of Route 31 and Kinsman Road.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°37'09" Longitude: 71°48'22"

Remarks:

This is the Saima Dam proposed in the Army Corps of Engineers North Nashua Study. For further information on this site see "Water Resource Development Plan -- North Nashua River Basin," U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965.

Site topography, costs, etc., are presented in the Appendices to the Corps' report.

Location:

On a tributary to Falulah Brook approximately 200 feet upstream from Fisher Road in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°36'35" Longitude: 71°47'02"

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area, therefore, no further investigations were made.

SITE NA-0307

Location:

On Pearl Hill Brook approximately 600 feet upstream from Northfield Road in Lunenburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°36'30" Longitude: 71°46'11"

Facilities Affected:

Below design high water elevation 505
11 houses
1050 feet of gas pipeline
Townsend Road

Below design high water elevation 495
11 houses
750 feet of gas pipeline
Townsend Road

Below design high water elevation 490
8 houses
650 feet of gas pipeline
Townsend Road

Below design high water elevation 480
3 houses
450 feet of gas pipeline
Townsend Road

Geologic Conditions:

The left abutment is outwash sand and gravel at the toe of the slope with thin englacial drift higher on the slope and underlain by schist bedrock. The right abutment is outwash sand and gravel at the lower terrace and englacial drift higher on the slope. Depth to schist bedrock is not known, but may be 10 to 15 feet.

SITE NA-0307 (Cont'd)

Geologic Conditions: (Cont'd)

There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cutoff to till or bedrock can be made. There are lots of large boulders in the foundation area.

SITE NA-0308 -- OLD PAGES POND

Location:

On Pearl Hill Brook, 400 feet upstream of Pearl Street in Lunenburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42°35'44" Longitude: 71°46'04"

Remarks:

This is the Pearl Hill Dam proposed in the North Nashua River Basin report. For further information on this site see "Water Resource Development Plan -- North Nashua River Basin," U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965.

Site information, costs, etc., are contained in the Appendices to the Corps of Engineers report.

There is also an existing pond at this site with a stone mill dam built in 1830. The dam is about 10 feet high. There are two spillways — an 8 foot weir and 3 foot weir. The dam is in fair condition with some minor seepage and trees growing along the downstream slope.

Location:

On a tributary to Pearl Hill Brook approximately 2800 feet upstream from Pleasant Street in Lunenburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°35'08" Longitude: 71°45'40"

Facilities Affected:

Below elevation 475 1100 feet of West Street

Below elevation 470 200 feet of West Street

Geologic Conditions:

Both abutments are outwash sand and gravel, Depth to schist bedrock in foundation not known, but may be 20 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0310

Location:

On a tributary to Notown Reservoir approximately 1000 feet upstream from Fifth Street in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°33'02" Longitude: 71°49'30"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (273 acres), therefore, no further investigations were made.

Location:

On a tributary to Notown Reservoir approximately 2200 feet northeast of Ball Hill in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'29" Longitude: 71°50'11"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (84 acres), therefore, no further investigations were made.

Public Ownership:

About 95% of this site is owned by the Massachusetts Department of Natural Resources.

SITE NA-0312

Location:

On a tributary to Notown Reservoir approximately 600 feet downstream from Parmenter Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'02" Longitude: 71°49'10"

Remarks:

This site did not meet criteria for this study due to the size of the contributing drainage area, (257 acres), therefore, no further investigations were made.

SITE NA-0313

Location:

On a tributary to Notown Reservoir approximately 4200 feet downstream from Parmenter Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'38" Longitude: 71°49'22"

Facilities Affected:

No facilities affected below elevation 785.

SITE NA-0313 (Cont'd)

Geologic Conditions:

The left abutment is englacial drift with thin outwash sand and gravel at the surface. The right abutment is englacial drift, silty sand and shallow to bedrock. Depth to bedrock in the foundation is not known, but may be 15 to 20 feet. There is a leakage problem in the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear to be fair.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cutoff to till or bedrock can be made on the left abutment.

Public Ownership:

This site is located within the Leominster State Forest.

SITE NA-0314

Location:

On a tributary to Notown Reservoir approximately 700 feet upstream of Granite Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°32'22" Longitude: 71°48'33"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (220 acres), therefore no further investigations were made.

NA-0315 -- HAYNES RESERVOIR

Location:

1500 feet upstream of Parmenter Road in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Latitude: 42⁰30'51"

Longitude: 71°48'10"

Surface Area (Acres)
55

Drain	age Area
(Acres)	(<u>Sq. Mi.)</u>
274	0.43

Potential

for

Expansion:

Limited by small drainage area.

Remarks:

This is a long earth fill dam. Upstream slope is riprapped. Spillway is about 8 feet wide and is constructed of granite blocks. Condition of the dam is fair to poor. Both slopes are covered with trees and brush.

Location:

On a tributary to Rockwell Pond, 1000 feet downstream of Distributing Reservoir in Leominister, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'45" Longitude: 71°47'03"

Remarks:

This is the Monoosnoc Dam proposed in the Army Corps of Engineer's North Nashua Study. For further information on this site see "Water Resource Development Plan -- North Nashua River Basin," U.S. Army Engineer Division, New England Corps of Engineers, Waltham, Massachusetts, January 1965.

Site topography, costs, etc., are presented in the Appendices to the Corps' report.

NA-0317 -- NOTOWN RESERVOIR

Location:

1500 feet south of Route 2 in Leominster,

Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°32'33" Longitude: 71°49'04"

Surface	Area
(Acres)

Height of Dam (Ft.)

Drainage (Acres)

(Sq. Mi.)

233

15

2920

4.57

Potential

for

Expansion:

Limited by Route 2 and would require a

long dam.

Remarks:

This is a long earth dam. Upstream slope has rock riprap. Spillway at left abutment

is about 4 feet deep by 50 feet wide.

The structure is in good condition, but has

some trees and brush along waterline.



Location:

On Falulah Brook approximately 250 feet upstream of Ashby West Road in Fitchburg, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°38'01"

Longitude: 71°50'17"

Facilities Affected:

No facilities affected below elevation 970.

Geologic Conditions:

Both abutments are thin discontinuous outcrops of silty sand and gravel, glacial till. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. An additional off-site borrow source will probably be necessary.

NA-0319 -- PIERCE POND

Location:

Upstream of Lindell Avenue in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Surface Area (Acres)

Height of Dam (Ft.)

Drainage Area (Acres) (Sq.Mi.

24

25

4416 6.9

Potential for

Expansion:

Limited by Route 2 and Merriam Street.

Remarks:

This is an earth dam. Spillway is a 50 foot concrete weir with a stone chute. Overall condition of the dam is fair. Upstream and downstream slopes are covered with birch trees. There is some concrete spalling on both sides of the spillway.



NA-0320 -- ROCKWELL POND

Location: On Monoosnoc Brook in Leominster,

Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
9	15	5950	9.3
/	±2	2720	7.5

Potential

for

Expansion: Limited by development on all sides.

Remarks: Elm Street forms the dam. Spillway is two 25 foot wide culverts under the road.

All structures are in good condition.



NA-0321 -- OVERLOOK RESERVOIR

Location:

1800 feet upstream of Caldwell Street in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage Area
(Acres)	(Ft.)	(Acres) (Sq. Mi.)
10	40	40 0.06

Potential for

Expansion:

Limited by need for extensive diking.

Remarks:

There is an earth dam at both the north and south ends of the reservoir. This reservoir is a storage basin for the Fitchburg Water System. Water is pumped to the site for storage and use. Condition of the south dam is good. The north dam is covered with trees and in fair condition.

NA-0322 -- GREEN'S POND

Location:

On Falulah Brook, just upstream of Route 31 in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Surface Area (Acres)	Height of Dam (Ft.)	<u>Drainage</u> (Acres)	Are (Sq.
11	15	J ₁ 860	7.

Potential

for

Expansion:

Limited by Ashby Road, Fishers Street and

Rindge Road.

Remarks:

This is an old stone dam with a concrete weir type spillway about 8 foot wide.

Condition is poor.



NA-0323 -- MORSE RESERVOIR

Location:

Upstream of Elm Street in Leominster,

Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Surface Area	Height of	_Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
11	30	180	0.28

Potential

for

Expansion:

Limited by small drainage area.

Remarks:

Elm Street forms the dam, the upstream slope is riprapped. There is an open spillway culvert under Elm Street 25 feet wide by 6-inches high. There appears to be some seepage at the downstream slope, but overall condition appears good.



NA-0324 -- LOVELL RESERVOIR

Location:

On Falulah Brook about 700 feet upstream of Scott Brook in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
21.	80	0070	2 01
34	00	2070	3.24

Potential for Expansion:

Steep topography limits further development.

Remarks:

This site is part of the Fitchburg Water Supply. The earth dam has a 75 foot wide concrete spillway at the right abutment leading to a paved chute; the dam has a rock paved berm at the 40 foot level on the downstream face. The upstream face is rock riprapped. There is a long dike along the left bank. The dam and spillway are in good condition.



NA-0325 -- SCOTT RESERVOIR

Location:

On Scott Brook about 500 feet upstream of Ashby West Road in Fitchburg, Massachusetts.

Fitchburg, Massachusetts Quadrangle

Surface Area	Height of Dam	Draina	ge Area
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
31	30	470	0.73

Potential for Expansion:

Expansion would affect Ashby West Road.
Drainage area will limit further development.

Remarks:

This is an earth dam with a 30 foot wide weir spillway on the left abutment with a paved rock outlet channel. The upstream slope of the dam is rock riprapped. Some brush is growing on slopes. Abutments appear gravelly.

NA-0326 -- BAKER POND

Location:

Upstream of Summer Street in Lunenburg,

Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Remarks:

There is no dam or structure at Baker Pond. It appears to be a shallow natural depression. Future development is restricted by drive-in theatre and shopping center. The pond is being filled in and used as a dump. No photograph

was taken at this site.

NA-0327 -- SMITH POND

Location:

On Monoosnoc Brook, 300 feet upstream of Granite Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Remarks:

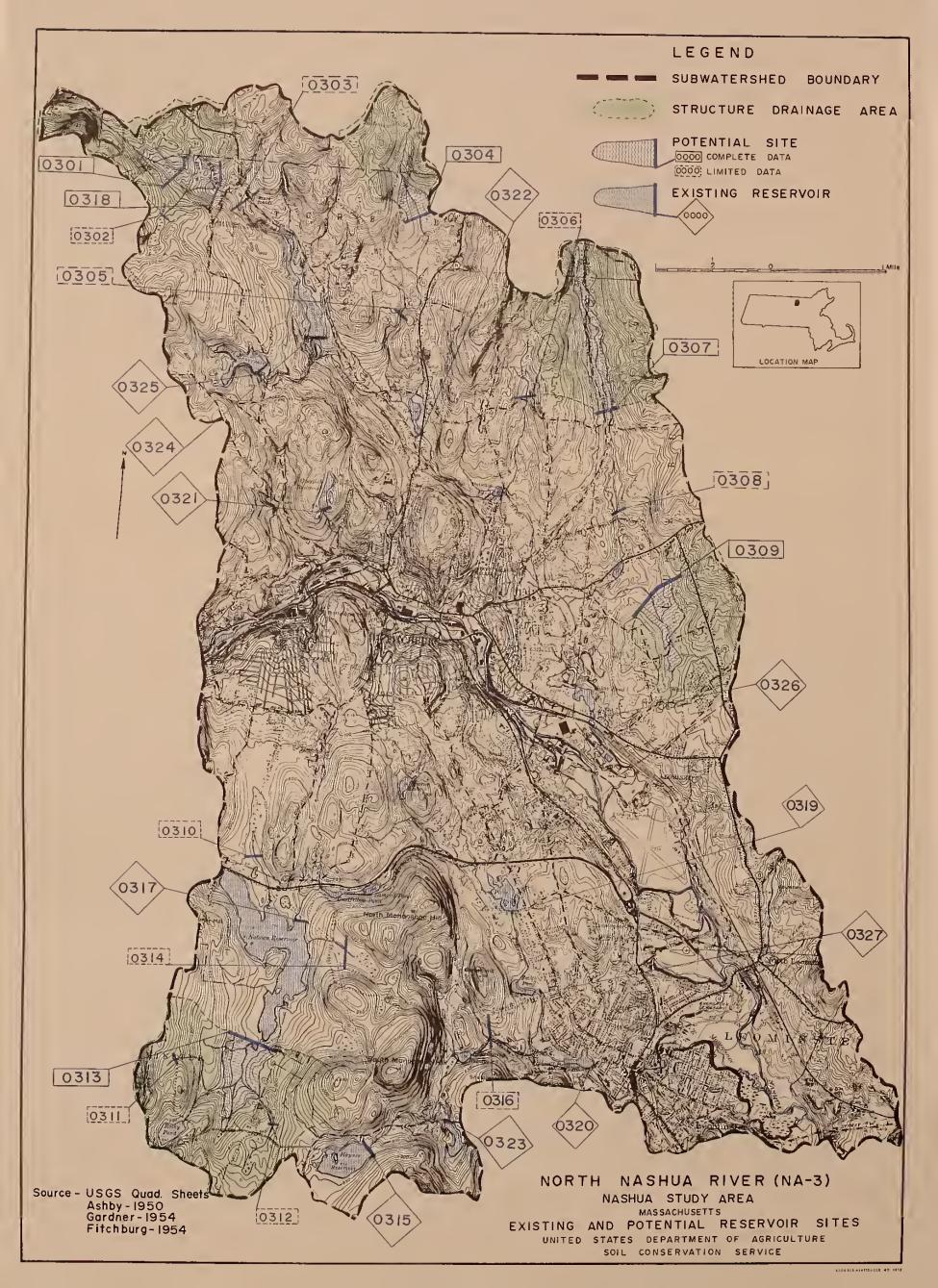
The old dam with granite block spillway is no longer impounding water. The entire structure is in poor condition. No photograph was taken at this site.

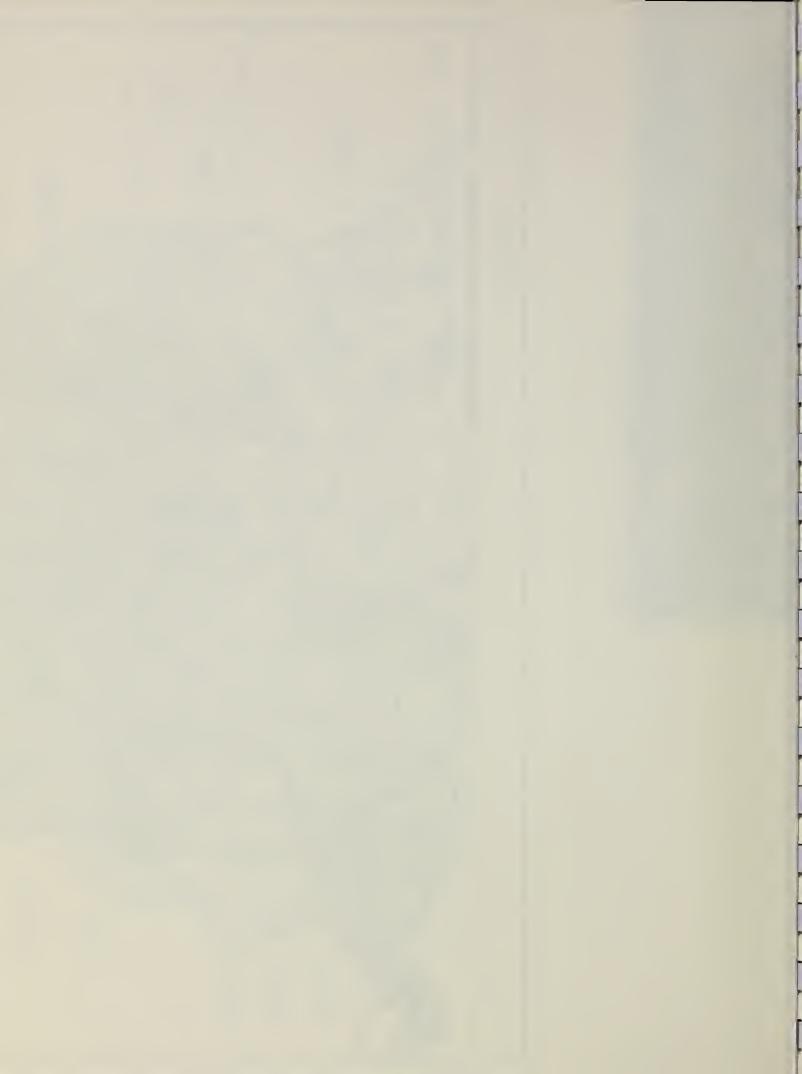
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NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-4, Nashua River

This subwatershed covers about 20,900 acres in the Towns of Lancaster, Leominster and Sterling, all in Worcester County. Fort Devens, a U. S. Army installation is partially within the subwatershed. The main streams are Wekepeke Brook; which originates above Fall Brook Reservoir in Leominster and flows generally easterly to the North Nashua River in Lancaster; and a portion of the North Nashua River which flows south easterly from Leominster to its confluence with the Nashua River in Lancaster. Elevations range from a high of about 1070 on Bayberry Hill to about 290 in Lancaster. Geology within the subwatershed is characterized by schist bedrock at depths of 15 to 50 feet, overlain by outwash sand and gravel.

Nineteen potential reservoir sites and two existing reservoirs were studied. Design summaries are included for eight potential sites that met study criteria.

SITE NA-0401

Location:

On Fall Brook approximately 200 feet upstream of Wachusetts Street in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°30'03" Longitude: 71°47'39"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (279 acres); therefore, no further investigations were made.

NA-0402 -- LEOMINSTER RECREATION AREA

LOCATION:

1600 feet upstream of Chestnut Street

in Leominster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'17" Longitude: 71°46'23"

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
7	25	340	0.53

Potential for

Expansion:

Site could be expanded, but the small drainage area would be a limiting factor.

Remarks:

This is an earth dam. Upstream slope is protected by mortared riprap. There are two spillways, a pipe spillway with riser and a concrete box culvert at the right abutment. Entire structure is in good condition.

Geologic Conditions:

The right abutment is schist bedrock. The left abutment is silty sand and gravel with cobbles and boulders -- dense glacial till. There is schist bedrock at the surface in the foundation. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, it contains cobbles and boulders. Waterholding capabilities appear to be good.



Location:

On Fall Brook approximately 100 feet upstream of Penn Central Railroad in Leominister,
Massachusetts.

Shirley, Massachusetts Quadrangle.

Latitude: 42°30'32" Longitude: 71°44'48"

Facilities Affected:

No facilities affected below Elevation 355.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash with swamp at low elevations. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities appear to be poor due to outwash on both abutments and swamp across the foundation. Preliminary structure designs indicated that a concrete emergency spillway (drop structure) will probably be needed to avoid excessive velocity in an excavated emergency spillway.

SITE NA-0404

Location:

On a tributary to Heywood Reservoir approximately 1800 feet upstream from May Street in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°29'03" Longitude: 71°47'35"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (128 acres); therefore, no further investigations were made.

NA-0405 -- HEYWOOD RESERVOIR

Location:

On Wekepeke Brook, 1500 feet upstream of North Row, in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°28'49" Longitude: 71°46'53"

Surface (Acre	
36	

Height of Dam (Ft.) 10

Drainage	Area	
(Acres)	(Sq. Mi.)	5
474	0.74	

Potential for Expansion:

Further development would be limited by the small drainage area.

Remarks:

This is an earth-fill dam with rock riprap on the upstream face. Principal spillway is a pipe outlet. Emergency spillway is a 15 foot wide concrete weir.

Geologic Conditions:

Both abutments are silty sand glacial till with cobbles and boulders. Depth to schist bedrock in foundation not known, but may be 40 to 50 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, it contains cobbles and boulders. Waterholding capabilities appear to be good.

Location:

Approximately 1000 feet upstream from Fitch

Basin in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°28'01" Longitude: 71°47'20"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (133 acres); therefore no further investigations were made.

SITE NA-0407

Location:

On Lynde Brook approximately 1500 feet downstream from Tuttle Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Longitude: 71°46'28" Latitude: 42°28'07"

Facilities Affected:

Below elevation 610

l barn

1200 feet of Tuttle Road

Geologic Conditions:

Both abutments are fine, poorly graded sand outwash with some gravel. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway

is at the right abutment.

Public Ownership:

About 15% of the site is owned by the Town of Clinton.

Location:

On Wekepeke Brook approximately 2600 feet upstream from Route 12 in Sterling, Massachusetts.

Sterling, Massachusetts Qudrangle.

Latitude: 42°28'12" Longitude: 71°45'22"

Facilities Affected:

Below elevation 535

2 houses 1 pump house

2050 feet of double wood-pole power lines

1500 feet of North Row

Below elevation 530

2 houses

1750 feet of double wood-pole power lines 900 feet of North Row

Below elevation 520

1050 feet of double wood-pole power lines 350 feet of North Row

Geologic Conditions:

Both abutments are outwash sand and gravel and may be shallow to till or bedrock. There are bedrock outcrops high on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made.

Public Ownership:

About 30% of the site area is owned by the Town of Clinton.

Location:

On a tributary to Wekepeke Brook approximately 3000 feet upstream from Route 12 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'31" Longitude: 71°45'18"

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area, (162 acres); therefore no further investigations were made.

SITE NA-0410

Location:

On Wekepeke Brook approximately 100 feet upstream of Penn Central Railroad in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°27'27" Longitude: 71°44'28"

Facilities Affected:

No facilities affected below elevation 410.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 25 to 35 feet. There are leakage problems on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete emergency spillway (monolithic conduit) will probably be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

This site is owned by the Town of Clinton.

Location:

On Wekepeke Brook approximately 1100 feet upstream from Flanagan Hill Road in Sterling. Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°27'58" Longitude: 71°44'12"

Facilities Affected:

Below elevation 400 100 duck shelters town barn Pratt Junction Road, Flanagan Road

Below elevation 375 100 duck shelters Pratt Junction Road Flanagan Road

Below elevation 390 100 duck shelters Pratt Junction Road, Flanagan Road

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. There are stream terrace deposits low on the left abutment. It is swampy across the entire foundation area. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete chute emergency spillway will probably be required to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 80% of this site is owned by the Town of Clinton.

Location:

On a tributary to Wekepeke Brook approximately 900 feet downstream from Jungle Road in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°28'42" Longitude: 71°43'36"

Facilities Affected:

This site was eliminated from further study due to high facility costs. Pumping station and overhead powerlines are in the pool area.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 80% of this site is owned by the Town of Clinton.

SITE NA-0413

Location:

On a tributary to Wekepeke Brook approximately 300 feet upstream from Jungle Road in Leominster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°28'57" Longitude: 71°43'53"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (354 acres), and facilities affected (railroad and powerlines); therefore no further investigations were made.

Location:

On a tributary to Wekepeke Brook approximately 3800 feet downstream from Brockelman Road in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: L

L2⁰28'19"

Longitude: 71°43'15"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (160 acres); therefore no further investigations were made.

SITE NA-0415

Location:

On a tributary to Wekepeke Brook approximately 4800 feet upstream from Bartlett Pond in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°28'29"

Longitude: 71°42'53"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (136 acres); therefore no further investigations were made.

Location:

On a tributary to Wekepeke Brook approximately 3000 feet upstream from Brockelman Road in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°28'19"

Longitude: 71°42'31"

Facilities Affected:

No facilities affected below elevation 390.

Geologic Conditions:

The left abutment is poorly graded sand and gravel outwash, very shallow to schist bedrock with outcrops at high elevations and swamp at low elevations. The right abutment is thin, poorly graded sand and gravel outwash with schist outcrops. Depth to schist or phylitte bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam constuction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be fair if a positive cutoff to bedrock is made on both abutments and the foundation.

SITE NA-0417

Location:

On a tributary to the Nashua River approximately 2810 feet upstream from Langen Road in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

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Latitude: 42°27'16" Longitude: 71°41'57"

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area, (262 acres); therefore, no further investigations were made.

Location:

On Runaway Brook near junction of town boundaries for Clinton, Lancaster, and Bolton, in Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°25'46" Longitude: 71°39'28"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (257 acres); therefore, no further investigations were made.

SITE NA-0419

Location:

On a tributary to the Nashua River approximately 500 feet upstream from High Street in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°26'31" Longitude: 71°40'01"

Facilities Affected:

Below Elevation 270

12 houses turkey farm

3 barns

2800 feet of Mill Street

Below Elevation 265

8 houses

turkey farm

3 barns

Below Elevation 260

1 house

turkey farm

2 barns

Below Elevation 255 turkey farm

Geologic
Conditions:

Both abutments are poorly graded sand and gravel outwash, with swamps at lower elevations. Depth to bedrock in the foundation is not known. There are leakage problems on both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

SITE NA-0419 (Cont'd)

Engineering Notes:

The recommended location for an emergency

spillway is at the left abutment.

Public Ownership:

The Massachusetts Department of Correction owns 20% of the site. The remaining area is owned by the Town of Clinton.

SITE NA-0420

Location:

On Ponakin Brook approximately 2400 feet downstream from Shoefelt Road on Fort Devens Military Reservation in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°29'05"

Longitude: 71°40'14"

Facilities Affected:

This site is located in the gunnery impact area of the Fort Devens Military Reservation; therefore, no further investigations were made.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to phylitte bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

The entire site is owned by the U. S. Army.

Location:

On Wekepeke Brook approximately 1100 feet upstream from North Main Street in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°29'10" Longitude: 71°43'02"

Facilities
Affected:

No affected facilities below elevation 320

Geologic Conditions:

The left abutment is poorly graded sand and gravel outwash, with swamp, outwash, and stream terrace deposits at the low elevations. The right abutment is poorly graded sand and gravel outwash, probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete chute emergency spillway will probably be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

The Town of Clinton owns about 10% of the site.

NA-0422 -- FALL BROOK RESERVOIR

Location:

On Fall Brook about 1000 feet upstream of Pleasant Street in Leominster,
Massachusetts.

Sterling, Massachusetts Quadrangle

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
76	30	820	1.28

Potential for

Expansion:

Development would require a long dam and a dike at the southern end of the reservoir. Small drainage area may limit further expansion.

Remarks:

This is a part of the Leominster Water Supply. The emergency spillway at the right abutment is about 25 feet wide and 6 feet deep. Structure is a long earthfill dam with riprap on the upstream slope. The dam has trees and brush growing on the downstream slope.



NA-0423 -- LAKE SAMOSET

Location:

On Fall Brook about 300 feet upstream of Grant Street in Leominster, Massachusetts.

Sterling, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage Area
(Acres)	(Ft.)	(Acres) (Sq. Mi.)
38	20	1640 2.56

Potential

for

Expansion:

Further development would be limited by

cottages located around the lake.

Remarks:

This is an earth-fill dam with a 20 foot wide, 5 foot deep granite block weir spillway. There are trees growing on the fill.

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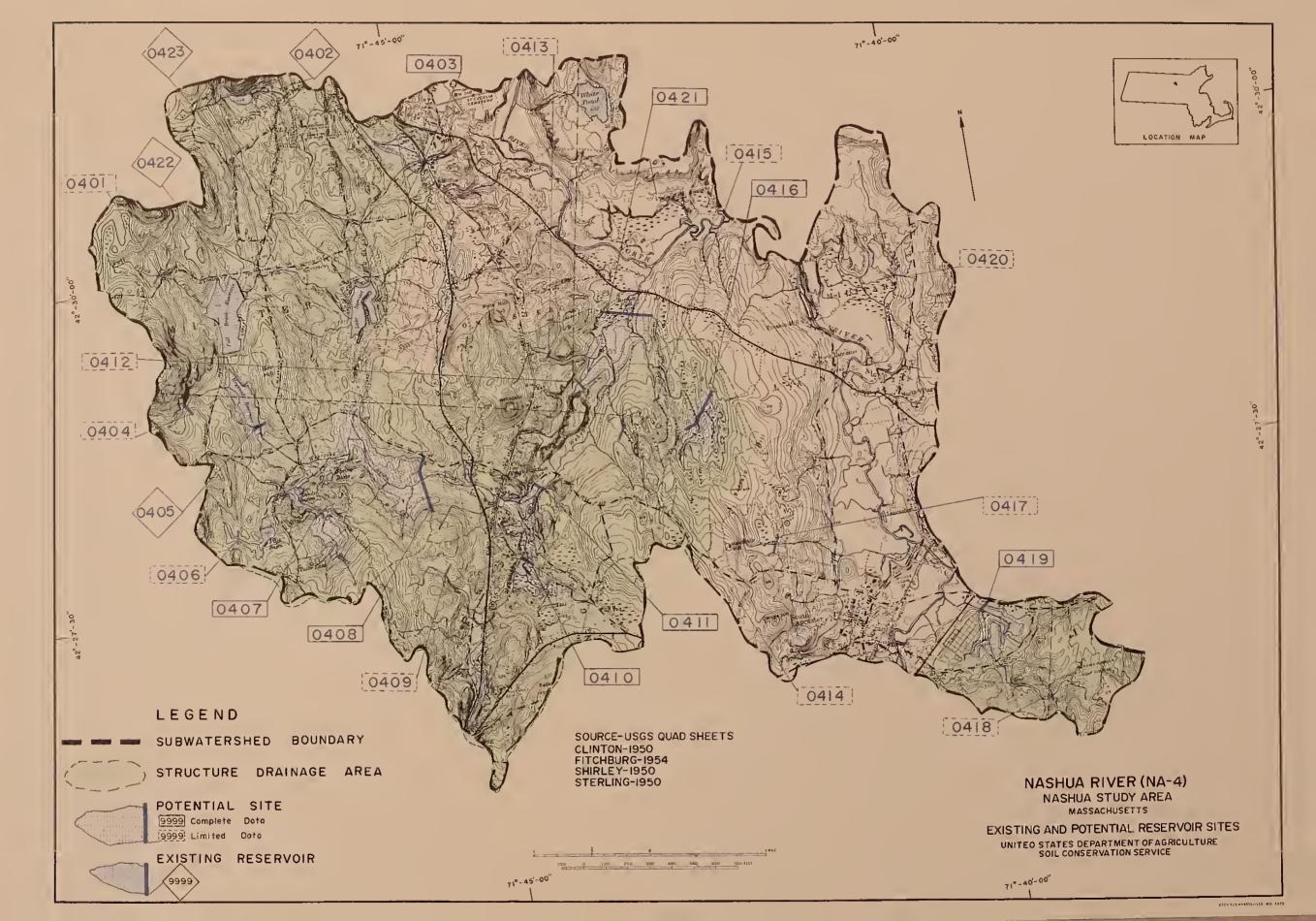
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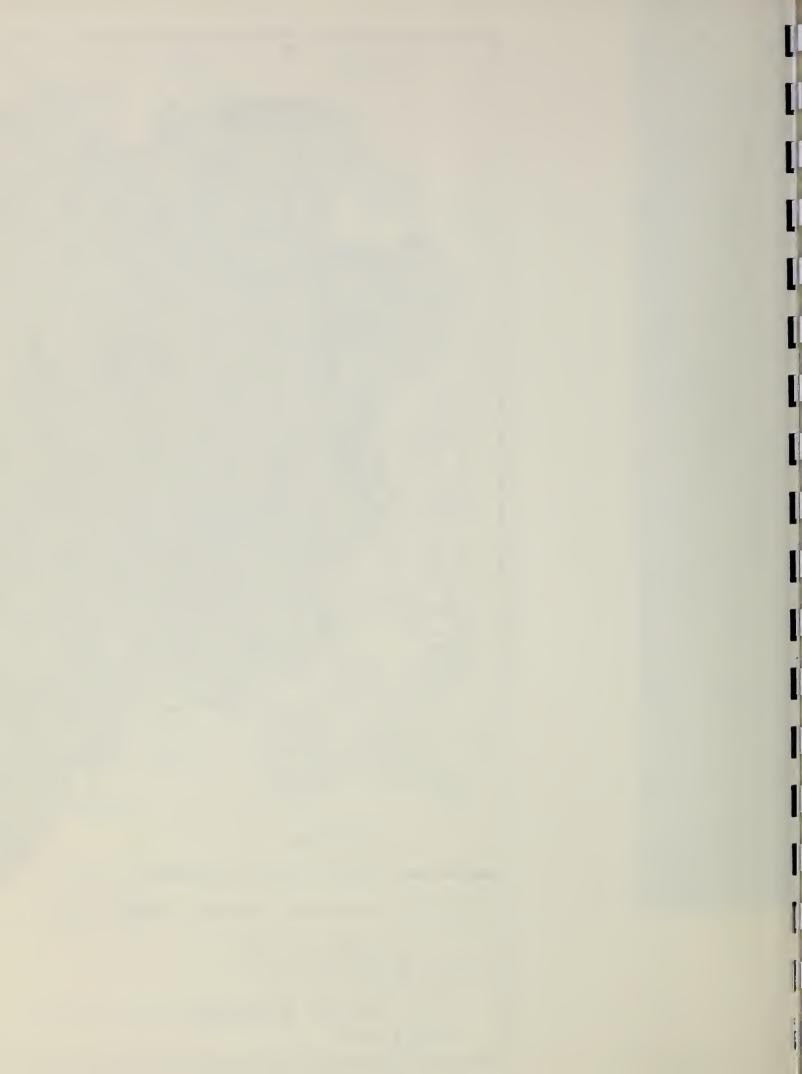
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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

COST COST
SITE RATING (3) STREAM WATER QUALITY (B) 10

-104-Notes





NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-5, Quinapoxet River

The Quinapoxet River subwatershed covers about 35200 acres in Holden, Paxton, Princeton, Rutland, Sterling, West Boylston and Worcester; all in Worcester County.

The main stream in this subwatershed is the Quinapoxet River which originates in Princeton and flows southeasterly through Holden and West Boylston, ending at Wachusett Reservoir. Elevations range from a high of about 1300 on Brown Hill to about 410 in Holden. Geology within the Quinapoxet River subwatershed is predominantly characterized by schist bedrock at depths of 5 to 25 feet, overlain by glacial till or outwash sand and gravel.

Twenty six potential reservoir sites and 12 existing reservoirs were studied. Preliminary design summaries are included for 19 potential sites that met study criteria.

SITE NA-0501

Location:

On South Wachusett Brook approximately 1900 feet upstream from Hubbardston Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°27'08" Longitude: 71°55'07"

Facilities Affected:

Below elevation 1030 2700 feet of Goodnow Road

Geologic Conditions:

Both abutments are silty sand, glacial till. Depth to schist bedrock in the foundation is not known, but may be 30 to 40 feet. There are no apparent leakage problems, but swamp foundation could be bad. Impervious borrow material for dam construction is available on site, however, it contains cobbles and boulders. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On South Wachusett Brook approximately 900 feet upstream from Calamint Hill Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°25'52" Longitude: 71°54'32"

Facilities Affected:

No affected facilities below elevation 880.

Geologic Conditions:

Both abutments are poorly graded sand and gravel with about 20 percent cobbles. Depth to bedrock in the foundation is not known, but may be 10 to 15 feet. There is a leakage problem in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be improved if a positive cutoff to bedrock can be made.

SITE NA-0503

Location:

On Cobb Brook approximately 900 feet upstream from Brooks Station Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Qudrangle.

Latitude: 42°26'15" Longitude: 71°53'30"

Facilities
Affected:

No affected facilities below Elevation 970.

SITE NA-0503 (Cont'd)

Geologic Conditions:

Both abutments are silty sand with cobbles and large boulders, glacial till and shallow to granitic bedrock. Depth to granitic bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. About 50 percent of the foundation is covered with boulders with a diameter greater than 3 feet, many of these with a diameter of 12 to 15 feet. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NO NA-0504

Location:

On Cobb Brook approximately 1100 feet upstream from Cobb Brook Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°25'13" Longitude: 71°53'20"

Facilities Affected:

No affected facilities below elevation 885.

Geologic Conditions:

The right abutment is silty sand and gravel with cobbles and boulders and shallow to bedrock. The left abutment is outwash sand and gravel at the toe, with glacial till and bedrock high on the abutment. Depth to bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems on the left abutment. Impervious borrow material for dam construction was not located on site in sufficient quantity. Water-holding capabilities appear to be fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities may be improved if a positive cutoff can be made through the terrace on the left abutment.

Public Ownership:

About 5% of the site is owned by the City of Worcester.

Location:

On South Wachusett Brook approximately 1500 feet upstream from Old Mill Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°24'40" Longitude: 71°53'27"

Facilities Affected:

Below elevation 780

3 houses 10 sheds 3200 feet of powerlines 3600 feet of Brooks Road 750 feet of Brooks Station Road

Below elevation 775

2 houses 9 sheds 3200 feet of powerlines 750 feet of Brooks Station Road

Geologic Conditions:

The left abutment is outwash sand or gravel with many cobbles. The right abutment is poorly graded sand or gravel with many cobbles, but silty in some areas. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are possible leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 15 percent. Waterholding capabilities appear fair.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Drilling may be required to determine the permeability of silty gravel. Preliminary structure designs indicate that a concrete chute spillway will probably be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 5% of the site is owned by the Town of Princeton. The City of Worcester also owns about 5% of the site.

Location:

On a tributary to Muschopauge Brook approximately 200 feet upstream from Glenwood Road in Rutland, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°24'16" Longitude: 71°56'23"

Engineering Notes:

This site does not meet criteria for this study. At the 10 to 1 drainage area to pond area ratio the depth at the dam is less than 7 feet. Drainage area is 534 acres. No further investigations were made at the site.

SITE NA-0507

Location:

On Muschopauge Brook approximately 2200 feet upstream from Wachusett Road in Rutland, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°23'45" Longitude: 71°55'45"

Facilities Affected:

Below elevation 1055 900 feet of Campbell Street 350 feet of Glenwood Road

Below elevation 1050 375 feet of Campbell Street 200 feet of Glenwood Road

Geologic
Conditions:

The left abutment is thin discontinuous englacial drift underlain by schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 15 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On outlet end of Holbrook Swamp approximately 1500 feet upstream from Quinapoxet Reservoir in Rutland, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle

Latitude: 42°23'40" Longitude: 71°53'29"

Facilities Affected:

No affected facilities below elevation 860.

Geologic Conditions:

The left abutment is silty gravel on the lower terrace and silty sand glacial till higher on the abutment. The right abutment is outwash gravel on the lower half of the abutment and dense silty sand higher on the abutment. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are no apparent leakage problems, but there could be some through the silty gravel terraces. Impervious borrow material for dam construction is available on site; however, rock size greater than 6-inches may run 20 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 70% of the site is owned by the City of Worcester.

SITE NA-0509

Location:

On a tributary to Quinapoxet Reservoir approximately 200 feet upstream from Whitney Road in Holden, Massachusetts.

Wachusett: Mountain, Massachusetts Quadrangle.

Latitude: 42°23'03" Longitude: 71°53'20"

Facilities Affected:

Below elevation 795 550 feet of Whitney Road 800 feet of Bryant Road

Below elevation 790
100 feet of Whitney Road
200 feet of Bryant Road

SITE NA-0509 (Cont'd)

Geologic Conditions:

Both abutments are silty gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 20% of the site is owned by the City of Worcester.

SITE NA-0510

Location:

On a tributary to Maple Spring Pond approximately 300 feet upstream from Route 122A in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°22'00"

Longitude: 71°54'04"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area; (118 acres); therefore, no further investigations were made.

SITE NA-0511

Location:

On a tributary to Maple Spring Pond approximately 150 feet upstream from Princeton Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°22'22" Longitude: 71°53'12"

Facilities Affected:

No affected facilities below elevation 785.

SITE NA-0511 (Cont'd)

Geologic Conditions:

The left abutment is silty sand glacial till. The right abutment is silty gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a possible leakage problem in the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 percent. Waterholding capabilities appear to be fair to good.

Engineering Notes:

Neither abutment is suitable for an excavated emergency spillway. A concrete emergency spillway will probably be necessary. Water-holding capabilities will depend on the permeability of gravel on the right abutment.

Public Ownership:

About 10% of the site is owned by the City of Worcester.

SITE NA-0512

Location:

On a tributary to Quinapoxet River approximately 300 feet upstream from the Quabbin Aqueduct in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°22'54" Longitude: 71°52'12"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (179 acres); therefore, no further investigations were made.

Location:

On Quinapoxet River approximately 1000 feet upstream from Mills Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°22'59"

Longitude: 71°51'27"

Facilities Affected

The Quabbin aqueduct becomes affected at about elevation 640.

Geologic Conditions:

Both abutments are coarse, cobbly gravel. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are leakage problems on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. It does not appear that an effective cutoff can be made. Preliminary structure designs indicate that a concrete chute emergency spillway may be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 10% of the site is owned by the Metropolitan District Commission. The Metropolitan District Commission also controls water rights on the river.

SITE NA-0514

Location:

On Governor Brook approximately 1500 feet upstream from Sterling Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°24'25" Longitude: 71°50'38"

Facilities Affected:

Below elevation 700

3 houses

1 shed

700 feet of power line 2500 feet of Sterling Street

SITE NA-0514 (Cont'd)

Facilities
Affected:
(cont'd)

Below elevation 695

2 houses 1 shed

2500 feet of Sterling Street

Below elevation 690

l house

Geologic Conditions:

Both abutments are silty sand, glacial till containing approximately 30 percent boulders. Depth to basaltic bedrock is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear to be good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 5% of the site is owned by the Town of Sterling. The Town of Holden also owns about 5% of the site.

SITE NA-0515

Location:

On Trout Brook approximately 4900 feet upstream from Manning Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'41" Longitude: 71°50'51"

Facilities
Affected:

Below elevation 660

l house l shed

500 feet of Woods Street 6700 feet of Mason Street 3600 feet of Sterling Road

SITE NA-0515 (Cont'd)

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to schist bedrock is not known, but may be deep. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. There seems little chance that an effective cutoff can be made. Preliminary structure designs indicate that a concrete emergency spillway (chute or monolithic conduit) may be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 50% of the site is owned by the Town of Holden.

SITE NA-0516

Location:

On a tributary to Trout Brook approximately 5500 feet upstream from Manning Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'54" Longitude: 71°50'14"

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area (242 acres); therefore, no further investigations made.

Location:

On Trout Brook approximately 1600 feet upstream from Manning Street in Holden, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'16"

Longitude: 71°50'22"

Facilities Affected:

Below elevation 660
3 houses
2 sheds
500 feet of Woods Street
6700 feet of Mason Street
3600 feet of Sterling Road
2400 feet of Moscow Street
900 feet of North Street

Below elevation 640

1 house
500 feet of Woods Street
6700 feet of Mason Street
3600 feet of Sterling Road
2400 feet of Moscow Street
900 feet of North Street

Geologic Conditions:

The left abutment is outwash sand or gravel. The right abutment is englacial drift with many cobbles and boulders. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the left abutment and the foundation. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities appear to be good if a cutoff can be made in the foundation and the left abutment. Preliminary structure designs indicate that a concrete chute spillway may be needed at lower levels of development to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

The Town of Holden owns the entire site.

Location:

On a tributary to Thomas Basin approximately 2300 feet upstream from Laurel Street in West Boylston, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°23'50" Longitude: 71°48'41"

Facilities Affected:

No affected facilities below elevation 605.

Geologic Conditions:

Both abutments are englacial drift with possibly outwash sand and gravel on the left terrace in the foundation. Depth to bedrock in the foundation is not known, but may be shallow. There is a possible leakage problem in the foundation. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good if the foundation is not sand and gravel.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0519

Location:

On Worcester Brook approximately 3000 feet upstream from Causeway Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°21'45" Longitude: 71°55'21"

Facilities Affected:

Gas station and equipment building at elevation 990.

Geologic Conditions:

Both abutments are silty sand glacial till. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There is a possiblity of leakage in the foundation. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

NA-0520 -- PINE HILL RESERVOIR

Location:

Near the Rutland-Holden-Paxton town line intersection in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Surface Area	
(Acres)	

Height of Dam (Ft.)

Drainage Area (Acres) (Sq. Mi.)

331

100

4130 6.46

Potential

for

Expansion:

Site appears to be fully developed.

Remarks:

This is a Worcester Water Supply reservoir. Structure is an earth dam with a large concrete section in the center with an ogee spillway.



Location:

On a tributary to Eagle Lake approximately 600 feet upstream from Kendall Road in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Latitude: 42°20'58" Longitude: 71°52'59"

Remarks:

This site did not meet criteria for this study due to size of contributing drainage area (231 acres); therefore, no further investigations were made.

SITE NA-0522

Location:

On a tributary to Chaffin Pond approximately 700 feet upstream from Salisbury Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°19'03" Longitude: 71°51'04"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area (261 acres); therefore, no further investigations were made.

SITE NA-0523

Location:

On a tributary to Chaffin Pond approximately 700 feet upstream from Newell Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42⁰19'28"

Longitude: 71°50'41"

SITE NA-0523 (Cont'd)

Facilities Affected:

Below elevation 795

14 houses

900 feet of Salisbury Street

Below elevation 785

9 houses

800 feet of Salisbury Street

Below elevation 770

4 houses

500 feet of Salisbury Street

Geologic Conditions:

The left abutment is outwash sand and gravel. The right abutment is silty sand, dense glacial till. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are leakage problems in the left abutment and the foundation. Impervious borrow material was not located on site. Waterholding capabilities appear fair to poor depending on cutoff.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0524

Location:

On Warren Tannery Brook approximately 500 feet upstream from Quinapoxet Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°21'52" Longitude: 71°52'15"

Engineering Notes:

Drainage Area = 696 acres
This site was eliminated from further study due
to low storage potential and high damages to
facilities.

Housing developments along right bank, Grove Cemetery, and Boston and Maine Railroad along left bank are affected.

Location:

On Quinapoxet River approximately 1300 feet upstream from Wachusett River Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°22'13" Longitude: 71°49'52"

Facilities Affected:

Below elevation 580

12 houses 1 garage

300 feet of Bullard Street 800 feet of Wachusett Street

Below elevation 575

1 house

700 feet of Wachusett Street

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to schist bedrock in the foundation is not known, but may be 20 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete drop structure will be needed as the emergency spillway.

Public Ownership:

About 10% of the site is owned by the Metropolitan District Commission.

Location:

On Poor Farm approximately 200 feet upstream from Newell Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°19'12"

Longitude: 71 50'14"

Facilities
Affected:

No facilities affected below elevation 740.

Geologic Conditions:

Left abutment is outwash sand and gravel.
Right abutment is silty sand, dense glacial
till. Depth to schist bedrock in foundation
is not known, but may be 20 to 25 feet. There
are leakage problems in the foundation and left
abutment. Waterholding capabilities appear fair.

Engineering Notes:

Recommended location for an earth emergency spillway is at the left abutment.

SITE NA-0527

Location:

On a tributary to South Wachusett River approximately 500 feet upstream from Hubbardston Road in Princeton, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle.

Latitude: 42°26'45" Longitude: 71°54'30"

Facilities Affected:

No affected facilities below elevation 990.

Geologic Conditions:

Both abutments are silty sand glacial till. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 90% of the site is owned by the Massachusetts

Audubon Society.

NA-0528 -- QUINAPOXET RESERVOIR

Location:

On the Quinapoxet River about 500 feet upstream of Princeton Street in Holden, Massachusetts.

Wachusett Mountain, Massachusetts Quadrangle

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
256	40	12570	19.63

Potential for Expansion:

Limited by the Boston and Maine Railroad on right edge of reservoir.

Remarks:

This reservoir is owned by the Bureau of Water, City of Worcester. Structure is an earth dam with a side channel inlet chute spillway on the right abutment. Inlet weir is about 200 feet long. Outlet channel is about 30 feet wide and 8 feet deep. Upstream slope of the dam is rock rip-rapped. Dam and spillway are in very good condition.



NA-0529 -- ASNEBUMSKIT POND

Location:

Downstream of Holden Road (Route 31) in Paxton, Massachusetts.

Paxton, Massachusetts Quadrangle

Surface Area
(Acres)
101

Height(F	of t.)	Dam
	 15	

Draina	ige Area
(Acres)	(Sq. Mi.)
287	0.15

Potential for

Expansion:

Further development would be limited by the small drainage area.

Remarks:

This is an earth fill dam. The upstream slope is rock rip-rapped. There is an 18-inch concrete pipe spillway with a gate, as well as a 20-foot wide concrete weir. It appears that water could flow around the right side causing undermining of the weir. Structure is owned by the Paxton Water Commission.

NA-0530 -- STREETER POND

Location:

At Pond Street in Paxton, Massachusetts.

Paxton, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage	The state of the s
(Acres)	(f't.)	(Acres)	(Sq. Mi.)
18	8	450	0.71

Potential

for

Expansion:

Further development is limited by the

small drainage area.

Remarks:

This is an old mill dam in poor condition. Downstream face of the dam is vertical stone masonry. There are large trees growing on the fill. The stone spillway at the right abutment is in very poor condition.

NA-0531 -- KENDALL RESERVOIR

Location:

Near Kendall Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle.

Surface Area (Acres)	Height of Dam (Ft.)	Drainage (Acres)	Area (Sq. Mi.)
166	25	1110	1.74

Potential for

Expansion:

Small drainage area may limit further expansion.

Remarks:

This is a Worcester water supply reservoir. Structure is an earth dam with rip-rapped upstream slope. Spillway is a 30 foot wide concrete chute. Some concrete spalling was noted on the sidewalls. Earth-fill section is well-maintained. This reservoir receives water diverted from Asnebumskit Brook.



NA-0532 -- STUMP POND

Location:

Upstream of Causeway Street in Holden,

Massachusetts.

Paxton, Massachusetts Quadrangle

Surface Area
(Acres)

28

4

Potential

for

Expansion:

Expansion would be limited by Causeway Street

as well as Route 122A and a school.

Remarks:

Causeway Street forms the dam. The spillway is a 36-inch culvert with a drop inlet.

NA-0533 -- EAGLE LAKE

Location:

Near High Street in Holden, Massachusetts.

Paxton, Massachusetts Quadrangle

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
حا.	٦.٢	<u> </u>	10.02
54	15	6550	10.23

Potential

for

Expansion:

Further expansion might be possible about 500 feet upstream at the site of an old breached dam.

Remarks:

This is a mill dam with concrete ogee spill-way consisting of 3 bays about 25 feet wide.



NA-0534 -- UNIONVILLE POND

Location:

Upstream of the intersection of Bullard Street and Wachusett Street in Holden, Massachusetts.

Worcester, Massachusetts Quadrangle

Surface Area (Acres)
22

Height (F	of t.)	Dam
2	20	

Drai	nage	Area	
(Acres)		(Sq.	Mi.)
1/160		2.	28

Potential for Expansion:

Expansion of this site appears feasible. Road and spillway would need to be rebuilt. Very few facilities affected by expansion.

Remarks:

Wachusett Street forms the dam for this site. The spillway consists of 2 36-inch diameter metal pipes. Structure is in fair condition. Concrete headwall is cracked.

NA-0535 -- MAPLE SPRING POND (PETER CARR POND)

Location:

Near Princeton Street in Holden, Massachusetts

Wachusett Mountain Quadrangle

Surface Area (Acres)
1. 1

41

Height	of	Dam
(Ft	·.)	_
-		

Drainage Area (Acres) (Sq. Mi.

970

1.52

Potential for

Expansion:

Limited by Boston and Maine Railroad along

east bank and Princeton Street.

Remarks:

Princeton Street forms the dam. spillway is a 4 foot wide drop structure about 15 feet upstream from a stone box culvert under Princeton Street. Overall

condition is fair.

NA-0536 -- MUSCHOPAUGE POND

Location:

Near Rice Hill in Rutland, Massachusetts

Wachusett Mountain, Massachusetts Quadrangle

Surface Area
(Acres)
68

Drainag	ge Area
(Acres)	(Sq. Mi.)
380	0.60

Potential for

Expansion:

Limited by the small drainage area.

Remarks:

This is a low earth-fill dam in poor condition. The upstream slope is rock rip-rapped. There is a stonelined spillway on the right abutment. The principal spillway is a 10-foot wide, 2 foot deep concrete weir. Trees are growing on the dam.

NA-0537 -- DAWSON POND

Location:

Near Salisbury Street in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Surface Area (Acres)	Drainage (Acres)	Area (<u>Sq. Mi.</u>)
19	590	0.92

Remarks:

Dawson Pond has no dam. No photos were taken.

NA-0538 -- CHAFFIN POND

Location:

About 1500 feet upstream of Salisbury Street

in Holden, Massachusetts.

Worcester North, Massachusetts Quadrangle

Surface Area	Drainage	Area
(Acres)	<u>(Acres)</u>	(<u>Sq. Mi</u> .)
112	2510	3.93

Remarks:

Chaffin Pond has no dam. No photos were taken.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

######################################	*******	BENEF	BENEFICIAL POOL	-			* EME	RENCY	EMERGENCY SPILLWAY	, X	* DESIGN	I GN		DAM		* SAFE
STORAGE COST	ELEV										* HIGH	WATER				YIE
AC FT IN (\$) AC FT		COST		COST/	DEPTH	CREST	STOR	AGE	COST			* TOP		FILL	* PERCENT	
Name		TORAGE	PER AC FT	AREA	SURF AC		* ELEV	AT C	REST	PER AC FT			* *	НСТ	VOL.	*CHANCE
DA	(MSL) AC	FT IN	(\$)	(AC)	(\$)	(FT)	(WSF)	AC FT	Z	(\$)	* (MSL)	(AC)	* (MSL	FT ((Y)	* (MGD)
0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0 0 0.0 0.0 0 0.	A-0501 SITE RATI	NG (1)	DA= 1.6	O SO M	I = I	024 AC	USGS 100-YR	DUAD- W	ACHUSET MY DEST	T MTN T	ASS	LATITU	DE 42-2	7-08 L	DNGITUDE	71-55-07
100 0.0			The same of the sa			1						1				*
117 13.1 490 64 8610 390.2 1012.6 E 1296 15.2 420 1016.9 74 1016.9 37 88 81 117 13.1 490 64 8610 390.2 1012.6 E 1296 15.2 420 1016.0 74 1016.9 37 88 81 1016.9 30.2 1012.6 E 1296 15.2 420 1016.0 74 1016.9 37 88 81 1016.9 30.2 1012.6 E 1296 15.2 420 1016.0 1028.0 1028.0 1028.0 180 8 2020 41.0 8 1025.0 E 2365 27.0 350 8 1027.4 104 8 1016.9 37 8 180 8 2020 41.0 8 1025.0 E 2365 27.0 350 8 1027.4 104 8 1029.6 50 180 8 2059 24.1 390 90 8990 42.5 8 1025.0 E 2365 27.0 350 8 1027.4 104 8 1029.6 50 180 8 2059 24.1 390 90 90 8990 42.5 8 1025.0 E 2365 8 120 8 8 1027.4 104 8 1029.6 50 180 8 2059 24.1 390 0.5 1106.0 18 61160 17.2 8 87.8 8 7.4 8 10.0 8 8 1.1 8 8 10.0 10.1 10.0 10.0			27.00	8	0000		995	u l		700	* 997.	4 (- 1		21	***
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Color Colo			400	98	9020	41.0	1023.5			360	* 1026.		*		168	* 1.29
Day 100 Day			390	06	8990		1				1				180	* 1.32
DA= 4,10 SQ MI = 2624 AC	********	******	*******	*****	*****	******	*******	* * *	******		* * * *	*****	******	******	*******	* * *
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FILE STORAGE COST CAST DEPTH CREST STORAGE COST COST CAST			BENEF	BENEFICIAL POOL	16				EMERGENCY	ENCY SF	SPILLWAY	P	DESIGN HIGH WATER	GNATER		DAM		SAFE YIELD
AC FT IN 121 (AC)	* * *	STOR	AGE	COST	ARFA	COST/	DEPTH	* * * * * * * * * * * * * * * * * * *	ST	STORAG	•		* * * # # # # # # # # # # # # # # # # #	* * A H A A	T0P F1.FV	HGT	FILL	* AT 95 *PERCENT *CHANCE
RATING (2) STREAM WATER QUALITY (A) 100-YR PRIN SPHY DESIGN STORM RUNDFF = 8.00 IN, PEAK FLON = 345 GFS 613 S.8 BYS 62 S.	(MSE)	AC FT	Z	AC FT	(AC)	(\$)	(FT)	AT TA		AC FT	Z	AC FT *	(MSL)	(AC)	* (MSL)	F	(1000 CY)	* (MGD)
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10 1.0	751.5	100	0.2	13850	36	38170	9.6	* 75	1.5 1	183		7560 *	766.2	96				
1671 1.9 1550 95 17550 24.4 ** 766.4 T 1154 2.0 1440 ** 775.2 134 ** 779.8 38 38 2.32 1654 3.0 1460 118 15990 22.9 ** 771.9 T 173 3.0 1090 ** 777.5 144 ** 779.5 38 38 2.37 1734 3.0 1460 118 15990 22.9 ** 771.5 137 3.0 3.05 1734 3.0 1460 118 15990 22.9 ** 772.5 1317 3.0 1734 3.0 1460 12 15530 30.5 ** 772.5 1317 3.0 1734 3.0 1440 12 1024 42 1040- MACHUSETT MTN MASS LATITUDE 42-23-45 LONGITUDE 71-55-4 1837 3.5 1540 23 18450 13.7 ** 1034.1 E 321 3.8 3.0 1038.5 1839 3.5 1540 2.3 18450 13.7 ** 1034.1 E 321 3.8 3.0 1839 3.5 1540 2.2 1044.0 E 324 4.1 1080 1037.4 54 1040.5 27 30 0.50 1839 3.5 1540 2.2 1044.0 E 321 3.8 3.0 1038.5 1839 3.5 1540 2.2 4.2 1040.5 E 2.0 3.2 1839 3.5 1540 2.2 4.3 2.0 3.7 1050.1 E 2.0 3.2 1839 2.1 2.4 3.0 3.7 1050.1 E 2.0 3.2 1830 2.2 4.3 2.0 2.0 1033.4 E 2.0 1053.9 2.0 1040.5 1830 2.2 4.3 2.0 2.0 1053.4 E 2.0 1053.9 2.0 1053.9 1830 2.2 4.3 2.0 2.0 1053.4 E 2.0 1053.9 2.0 1040.5 2.1 1830 2.2 4.3 2.0 2.0 2.0 2.0 1.1 1830 2.2 4.3 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 1830 2.2 4.3 2.0	759.3	489	0.8	3460	99	25520	17.2	* 75	19.3 T	572	1.0	2950 *	773.5	126	* 777.0		30	* 1.39
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1734 3.0 1080 121 15530 30.5 = 772.5 1817 3.3 1030 = 777.4 144 = 779.5 38 37 = 3.05	171.9	1654	3.0	1140	118	15990	59.9	17 .	O.	1737	3.0	1090 *	777.5		* 779.8		38	* 2.97
Data Data	172.5	1734	3.0	1080	121	15530	30.5		0	1817	m •	1030 *	111.4		* 779.5		37	* 3.05
DA= 1.60 SQ MI = 1024 AC	*****					*****				******	******	******	******		*		******	*****
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2704 31.7 340 * 1053.9 240 * 1057.1 43 106 * 1.3 ************************************	1047.6	1523	17.9	550	172	4 900	33.7	* 105			23.5	420 *	1051.1	216	1054.6		06	* 1.18
AND COST DATA. ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE TON. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO	1050.9	2133	25.0	430	212	4350	36.9	* 105	3.4 E	2704	31.7	340		240	1057.1	•	106	* 1.33
CONSIDERED ACCURATE TO THAT DEGREE.	NOTES -	(1) CC (2) EN (3) EN (4) TA	STS AR ERGENC ERGENC BULAR	KE BASED Y SPILL Y SPILL	ON 19 MAY ST MAY TY BASE	71 S.C. ORAGE A PE CODE D ON PR	S. DESI ND COST - C=CON	GN CR S ARE ICRETE RY IN	BASEI CHUTI	A AND C D ON TC E, D#CC	COST DA TAL ST NCRETE	TA. ORAGE, DROP, SHOWN	INCLUDIR E=EXCAV/	NG BEN ATED,	EFICIAL T* TWO S FOR COM	POOL. PILLWA'	• N= PURPO	NONE SES.
			NSIDER	NS ARE	SHOWN RATE T	TO THE	шшк	•	FOOT	TO SHOW	VARIA	TION BE	TWEEN DE	EVELOP	MENTS ON	ILY, AN	D ARE N	10

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SAF	FILL *PERCENT	VOL *CHANCE	CY) * (MGD)		9 #	28 + 0.34	*	*	* *	7.5 + 887	T UDE	*	36 * * * * *	38 * 0.28		*		**************************************	H	* 1	24 * 0.24	*	*	*	140 * 1.04		N= NONE
DAM	<u>L</u>	HGT V	FT	LONG	AK FLU	21	29	37	46		10 4		28	67	46	57		*** L0	PEAK FLOW	0	17	25	32	38	*	000	ILLWAYS
70	T0P	Et EV	* (MSL)	2-23-40	* * COU IN, PEAK FLUW	821.0	828.6	837.3	845.8	040.0	E 42-23-03 LONGI		760.2	1.001	778.0	788.5	790.5	4	IN,	0	768.8	776.8	783.5	789.8	789.8	CIAL PO	TWO SP
# #		AREA *	(AC) *	LATITUDE 42-23-40 LONGITUDE	* * * * * * * * * * * * * * * * * * *	128 *		188 *	222 *	230	LATITUDE		* 14	* 4 2 7 7 7 7 7	103 *	153 *	164 *	LATITUDE	≠ 8.00	* :	100	* 62	# 56	107 *	-	G BENEF	E=EXCAVATED, T= TWO SPILLWAYS, N= NON
* DESIGN * HIGH WATER		ELEV	(MSL)	S	KUNUFF	818.0	825.4	834.0	843.1	84000	S LA RUNDFF	1	757.5	768 2	776.0	785.9	787.8	******	RUNDFF	0 0 0	766.9	774.2	780.7	786.2	787.0	NCLUDIN	E=EXCAVATED, T= TWO SPILLWAYS,
	STORAGE COST & TOP & TOP PILL &	PER *	* (\$)	QUAD- WACHUSETT MTN MASS	# * O C C	500 *	360 *	* 062	250 *	0	QUAD- WACHUSETT MTN MASS PRIN SPWY DESIGN STORM	*	* 008	* * 0 0 0	* 064	410 *	* 005	******* SS	STORM	* :	1 700		620 *	520 *	785°0 E 1795 25°9 490 # 787°0 109 #	DATA. STORAGE, INCLUDING BENEFICIAL POOL.	DROP,
SPILLWAY	SE		Z	CHUSETT	TALL STAT DESIGN STORM	1	8.6	16.7	25.2	*	USGS QUAD- WACHUSETT MTN MA.	•	4.	* 0	15.1	25.9		QUAD- PAXTON MASS	SPWY DESIGN STORM		7.B	ω ω ω	16.5		25.9	AND COST DATA.	TE CHUTE, D=CONCRETE
SENCT S	STORAGE	AT CREST	AC FT	UAD- WA	ALV VI	F 1050			E 5237		JAD- WA			1006		E 2766	3022	UAD- PA)	PRIN SPW	6	191	E 613	~		E 1795	IA AND COST	TE, D=CI
Σ ω	. CREST	ELEV - TYPE	(MSL)	USGS Q		815.5			840.6	040.1	USGS 0-YR			7.007			4.	USGS Q1	00-YR P		764.5			- 1			ш
BENEFICIAL POUL *	DEPTH .	DAM *+	(FT) *	36 AC	*	5.1 *	16.4 #	27.0 *	38.2 *	- 1	30 AC	*		13.7 *	1	* 0.65	£0°6 #	832 AC	(A) 1	# x			23.7 *	29.5 #	782.5 1533 22.1 570 99 8830 30.5 年 · **********************************	DESIGN CR	
	COST/	SURF	(\$)	1 = 2496	SIKEAM WAIEK WUALIIT (A)	11140	6080	0009	6560	0000	= 2.00 SQ MI = 1280 AC STREAM WATER QUALITY (A)		0000	11900	9640	9080	8950	* * * * 11	QUALITY		12040	7770	8460	9040	8830	BASED ON 1971 S.C.S. SPILLWAY STORAGE AND	-3000 3
76		AREA	(AC)	3 90 SQ MI =	A P C	47		165	200	607	2.00 SO MI	•		67		126	136	1.30 SQ MI	STREAM WATER	,	27		83	96	66	ON 197	MAY TYP
BENEFICIAL POOL	COST	PER AC FT	(\$)	DA= 3	S I KEA	5230	999	370	280	007	DA= 2.		0,0	0404	570	470	460	DA= 1.	STREA		3250	1180	770	620	570	E BASED ON	Y SPILL
BENEFI		STORAGE	Z			0.5	5.4	12.7	22.5	0.62	3		0.0	ο α ο α	13.0	22.6	25.0		(2)	•	4.6	6.1	13.2	20.2	22.1	COSTS ARE	EMERGENCY
		STOR	AC FT		ON ING	100	1120	2650	4690				0 0	100	1383	2410	2667		SITE RATING (2)	c	100	427	617	1407	1533	(1) CC (2) EN	(3) EN
		ELEV	(MSL)	NA-0508	3116	805.0	816.4	827.0	838.1			0	7.867	750.2	771.0	781.0	782.9	NA-0511	SITE	7 2 2 2	762.0	769.2	775.8	781.2	782.5	NOTES -	

BENEFICIAL POOL *	AL.	POC					EMERG	EMERGENCY S	SPILLWAY		NCY SPILLMAY * DESIGN * HIGH WATER *	I GN I AT ER		DAM		* SAFE * YIELD	•
COST PER	SST R		AREA	COST/ SURF	DEPTH AT		CREST ELEV TYPE	STORAGE AT CREST	GE EST	COST PER AC FT	ELEV	AREA	>	НСТ	FILL VOL		
(\$) NI	(\$)		(AC)	(\$)				AC FT	Z	(\$)	(WSF)	(AC)	* (MSL)	FT	(X)	* (MGD)	
NA-0513 DA= 21.60 SQ MI = 13824 AC SITE RATING (3) STREAM WATER QUALITY (A)	TRI	L . 6	0 SQ WATE	DA= 21.60 SQ MI = 13824 AC STREAM WATER QUALITY (A)		10	USGS QU 00-YR PR	######################################	**************************************	**************************************	****	ATITUD	**************************************	59 LON PEAK FL	VGITUDE	**************************************	
10	245	000	30 61 94	33700 31870 24730			623.5 E 636.4 T 650.0 T	354 970 2015	0.3	2900 2010 1150	626.0 650.9 664.2		* 629.5 * 656.3 * 669.8	29	18 109 211	* 0.62 * 2.42 * 4.24	
009 6.2	0		11.9	20830	29.80		1 8.660			810	6000	146			211	* 5.57 *	
DA= ST		2.6 REAM	= 2.60 SQ MI STREAM WATER	**************************************		10	USGS QL 00-YR PR	AD- ST	A STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF THE STATE OF T	**************************************	* *:	**************************************	42-24 42-24 0 IN	.25 LONGI PEAK FLOW	**************************************	******** F 71-50-38 775 CFS	
1 0	12 9 6 7	180 840 940 710	31 64 106 152	20170 11220 8600 8550	1 1			1	1 1	970 1060 950 710 560	680.8 682.9 687.8 694.5		683.0 683.0 685.0 690.0		50 58 63 189	* * * * * * * * * * * * * * * * * * *	-136-
1010 1101 010 010 010 010 010 010 010 0	10	* * * *	5.57 SQ MI	010	3565 AC		0.55.0 E	JAD- ST	480 ALS ALS 480 ASS ASS ASS ASS ASS ASS ASS ASS ASS AS	# 5015 710 450 # # # # # # # # # # # # # # # # # # #	****	320 ***** ATITUD	# 099.8 36 ####################################	41 LON	LONGITUDE	* 1.88 ******** 71-50-51	
2	148	000	12 27 27 59	91550	1		1 6 8 6 1	1719	5.8 0.5 1.6	1390 16940 5310		146 97 132	659.8 651.9 658.5	32	1	* * * * * * * * * * * * * * * * * * *	The second of th
3.2 2800 5.0 1820	1820		124	22040	32.5	* * *	652.5 T	1542	3.4	1770	656.5	155	* 659.8 * 659.9	0 4 4	47	* 1.67 * 2.16	
NOTES (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN (2) EMERGENCY SPILLMAY STORAGE AND COSTS (3) EMERGENCY SPILLMAY TYPE CODE- C=CONCR (4) TABULAR DATA ARE BASED ON PRELIMINARY (5) ELEVATIONS ARE SHOWN TO THE NEAREST O CONSIDERED ACCURATE TO THAT DEGREE.	SPI SPI AR AC	E S S C C S C C S C C S C C S C C S C C S C	######################################	ASED ON 1971 S.C. PILLWAY STORAGE A PILLWAY TYPE CODE A ARE BASED ON PR ARE SHOWN TO THE ACCURATE TO THAT	BASED ON 1971 S.C.S. DESIGN SPILLMAY STORAGE AND COSTS SPILLMAY TYPE CODE— C=CONCATA ARE BASED ON PRELIMINAR SARE SHOWN TO THE NEAREST OF ACCURATE TO THAT DEGREES	S AR CRET CRET 0.1	CRITERIA AND ARE BASED ON ETE CHUTE, DH INFORMATION.	+ + + + + + + + + + + + + + + + + + +	**************************************	TERIA AND COST DATA. BASED ON TOTAL STORAGE. CHUTE, D=CONCRETE DROP. TORMATION. FIGURES SHOWN.	DATA. STORAGE, INCLUDING STORAGE, INCLUDING TE DROP, E=EXCAVATE ES SHOWN ARE PRIMAR LES SHOWN BETWEEN DEVE	ING BEN ATED, IMARILY DEVELOPI	**************************************	POOL. PILLMAY: PILLMAY: IPARISON	* Z & W	**************************************	
		*	NO N	UI USE	** DU NUI USE FOR FINAL		SITE SE	LECTIO	N UK L	AND ACEL	SELECTION OR LAND ACQUISITION.	* * * * *					

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SUBMATERSHED-QUINAPOXET RIVER

STUDY AREA-NASHUA RIVER

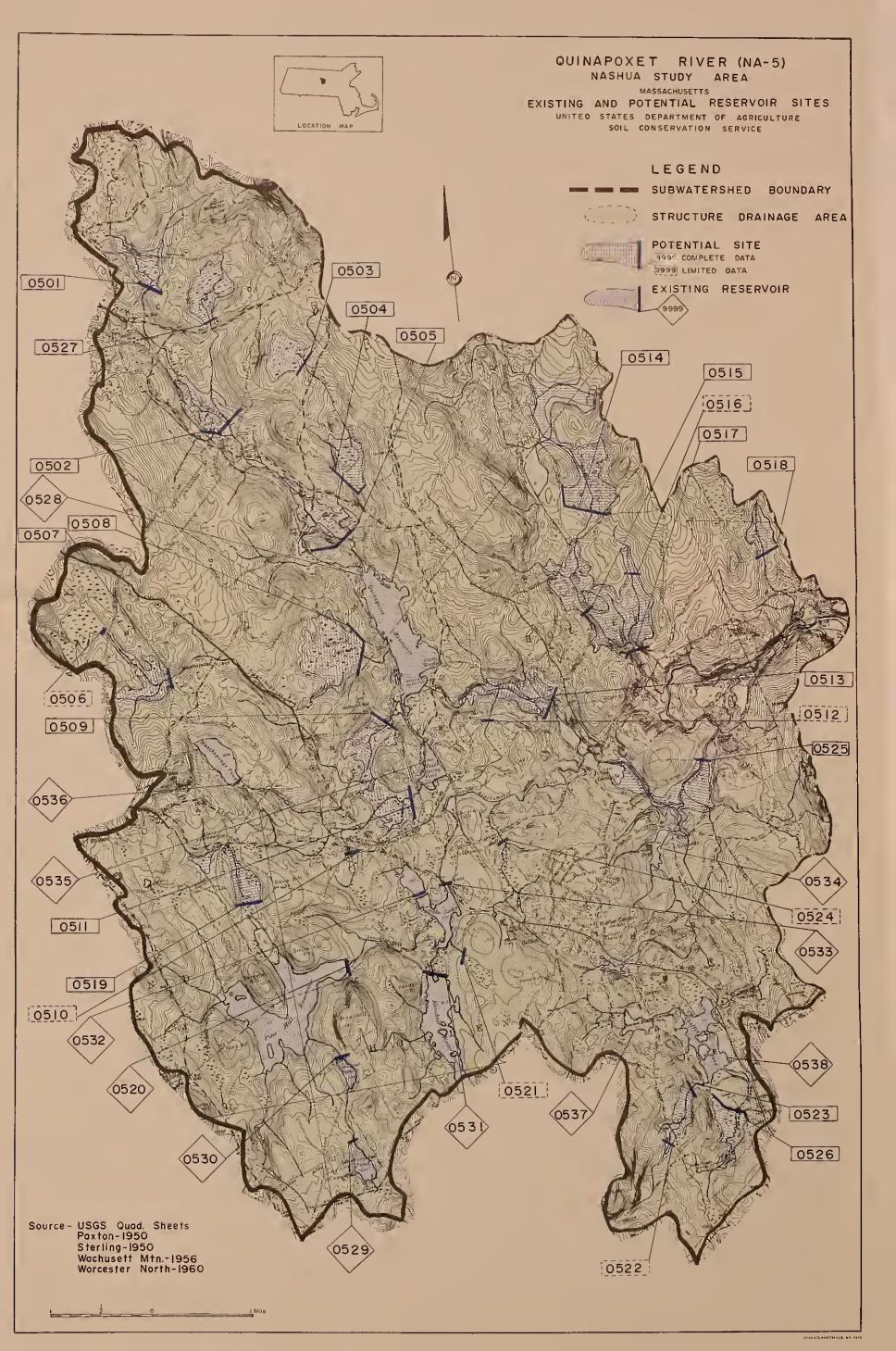
Character STORAGE COST			BENEF	BENEFICIAL POOL	JOL			* *	MERGENCY	1	SPILLWAY	* *	DESIGN HIGH WAT	IGN		DAM			ا <u>د</u> س
STORAGE DER AREA SUR STORAGE DER RELEY AT CREST DER RELEY AREA RELEY TOOL				COST		COST/		* CREST		TORAGE		0ST *			T0P		FILL	* PERC	EN
AC FI IN (\$) (\$) (\$C) (\$C) (\$C) (\$C) (\$C) (\$C) (ELEV	STO	RAGE	PER AC FT	AREA	SURF	DAM	* ELEV *+ TYPE		T CRES		ER *	ELEV	AREA	• ELEV	HGT	VOL (1000	*CHAN	CE
100 2.0 3360 22 37640 15.7 789.2 199.4 1440 771.5 36 774.7 25 24 20 2.0 36 36 22 37640 15.7 789.2 199.4 1440 771.5 36 774.7 25 29 39 39 39 39 39 39 39	(MSL)	AC FT	Z *	(\$)	(AC)	(\$)	(FT)	* (MSL)		FT ***	* * * Z *	* (\$)	(MSL)	(AC)	* (MSL)		CY)	* (MG	(0)
100 0.0 0 456 0 37640 13.7 6.6 199 4.1 4140 770.7 35 772.4 22 19 330 6.6 2250 225 237640 12.7 75.2 E 172.3 5.6 4860 770.7 35 770.7 35 772.4 22 19 330 6.6 2250 13.5 1820 45 28310 30.9 783.4 E 778.16.2 1520 8 785.8 60 788.4 38 77 1 100.0 30 39 9 120 0.0 120 1200 6.2 0.0 13.0 120 120 0.0 13.7 79.1 E 1277 26.5 1100 793.5 78 78 797.5 48 120 1200 25.0 1200 73 19690 40.2 792.7 E 1277 26.5 1100 793.5 78 78 797.5 48 120 1200 0.0 120 1200 0.0 120 1200 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 0.0 120 120 120 0.0 120 120 0.0 120 120 120 0.0 120 120 0.0 120 120 120 120 120 120 120 120 120 12	NA-0523 SITE	RAT ING	(3)	DA= 0.	90 SQ	MI =	576 AC TY (A)	USGS 100-YR		SPWY	ESTER DESIGN	NORTH	2	UTIT	42-19- 0 IN;	AK	NGITUDE LOW =	71 26	0-4 CFS
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TOTAL COLUMN 1	788.7	1090	22.7	1290	68	20490	38.7	* 791.	2 E		6.5	1100 *	793.5		797.5	48	120	*	73
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E RATING (3) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.00 IN, PEAK FLOW = 268 C	******	* * * * * * * * * * * * * * * * * * * *		DA= 0.	90 50	* * * * *	*******	********		WORC MORC	******	NORTH	AASS L.	ATITUD	-	•	******		0-1
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3 100 2.0 16180 24 68500 7.3 * 717.8 E 174 3.5 9300 * 720.2 34 * 721.8 14 4 * 0.2 4 32.0 6.6 5460 37 46650 14.3 * 724.9 E 425 8.8 4110 * 727.2 45 * 729.3 21 21 * 0.4 0.4 0 650 13.5 3040 49 40460 22.0 * 732.5 E 790 16.5 2500 * 734.9 60 * 737.2 29 68 * 0.5 7 1090 22.7 2060 66 33810 29.7 * 740.2 E 1269 26.4 1770 * 742.4 76 * 745.4 37 156 * 0.7 3 1200 25.0 1940 70 33220 31.2 * 741.8 E 1390 29.0 1670 * 744.0 80 * 747.9 40 190 * 0.7 1*** * * * * * * * * * * * * * * * * *	709.2	0	0.0		7		1.2	* 718.	5 E			8020 *	721.0		723.8	16	9	:	*
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3 1200 25.0 1940 70 33220 31.2 * 741.8 E 1390 29.0 1670 * 744.0 80 * 747.9 40 190 * 0.7 ***********************************	737.7	1090	13.5	3040	64	33810	22.0	* 732° * 740°				2500 *	734.9		737.2	37	156	• •	59
- (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLMAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLMAY TYPE CODE— C. CONCRETE CHUTE, D. CONCRETE DROP, E. EXCAVATED, T. TWO SPILLMAYS, N = NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. (5) ELEVATIONS ARE SHOWN TO THE NEAREST O. I FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO CONSIDERED ACCURATE TO THAT DEGREES.	739.3	1200	25.0	1940	70	33220		741.	*	1390 2	9.0	1670 *	744.0	80		0.7	190	0	75
EMERGENCY SPILLWAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO CONSIDERED ACCURATE TO THAT DEGREE.	NOTES -	(2) E	JSTS AR	E BASECY SPILL	MAY ST	71 S.C.	S. DES ND COS		ERIA A	AND CO	ST DAT		INCLUBI	NG BEN	FICIAL	.000			
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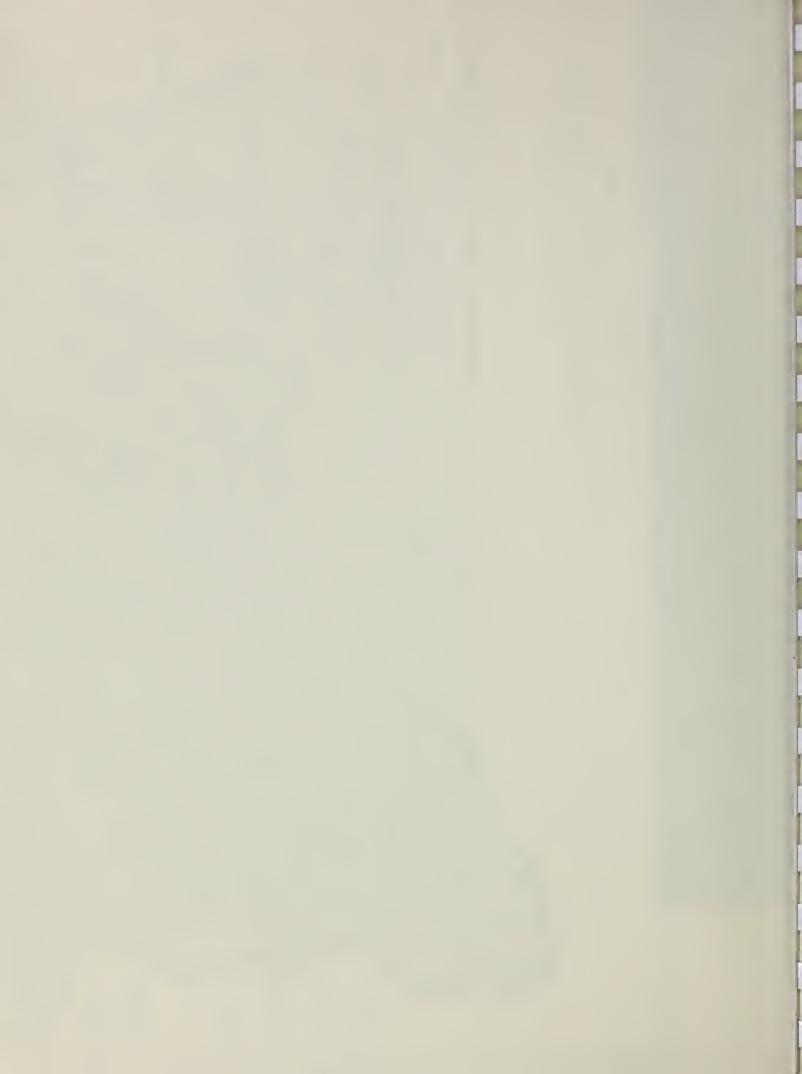
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# HIGH WATER # ***********************************		* EME	EMERGENCY SPILLWAY	*	DESIGN	*	DAM	* SAFE
EV STORAGE PER ARE/ SL) AC FT IN (\$) (AC ENERGY PER ARE/ AC FT DEST ENERGY PER ARE/ AC FT ENERGY PER	*********	*			* HIGH WATER	*		* YIELD
EV STORAGE PER ARE/ SL) AC FT IN (\$) (AC ***********************************		***************************************	※本本本の本本を中央を主要を主要を主要を主要を主要を主要を主要を主要を主要を主要を CHD C M U D M U M U M U M U M U M U M U M U M	*******	******	*******	******	**
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SL) AC FT IN (\$) (AC) ***********************************	AC			* <u>+</u> :		*		00
0527 DA= 1-10 S() (\$) (FT)		AC FT IN	(\$) * ((\$) * (MSL) (AC) * (MSL)	1 * (MSL)	FT	CY) * (MGD)
DA DA	**********	**********	***********	********	*****	*******	*	**********
	0 MI = 704 AC		QUAD- WACHUSET	T MTN MASS	LATIT	JDE 42-26-	.45 LONG	LATITUDE 42-26-45 LONGITUDE 71-54-30
	STREAM MATER QUALITY (A)		100-YR PRIN SPWY DESIGN STORM RUNDFF =	SN STORM	RUNOFF =	8.00 IN, PEAK FLOW =	PEAK FLON	I = 190 CFS
		*		*	-	*		*
963.6 0 0.0	5	3.6 * 974.6 E	5 E 243 4.1	730 *	977.0 73	3 * 980.0	20	11 * ****
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203 3.5 1140	4790	16 +	E 354	* 059				12 + 0.35
409 7.0 710	3890	16 *		+ 024		*	26	21 * 0.50
718 12.2 470	3450	# 98		340 *	985.4 106			28 * 0.68
982.5 874 14.8 390 100	3430	22.5 # 985.0	5.0 E 1138 19.4	300 *	986.6 108		5 29	28 * 0.75
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NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.	1971 S.C.S. I STORAGE AND C	DESIGN CRITE	ERIA AND COST DA	ATA. TORAGE, IN	CLUDING BI	ENEFICIAL	POOL.	
(3) EMERGENCY SPILLMAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLMAYS, N= NONE	TYPE CODE- C=	-CONCRETE CH	HUTE, D=CONCRET	E DROP, E=	EXCAVATED ,	T= TWO S	PILLWAYS	N= NONE
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(5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 CONSIDERED ACCURATE TO THAT DEGREE.	N TO THE NEAF TO THAT DEGR		FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE	ATION BETW	EEN DEVEL	OPMENTS OF	ILY, AND	ARE NOT TO BE
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Notes





NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-6, Stillwater River

The Stillwater River subwatershed covers about 48,400 acres in Berlin, Bolton, Boylston, Clinton, Holden, Lancaster, Leominister, Princeton, Sterling, West Boylston, Westminster and Worcester; all in Worcester County.

The main stream in the subwatershed is the Stillwater River which originates in the Leominster State Forest and flows southeasterly through Princeton, Sterling and West Boylston to Wachusett Reservoir. Elevations range from a high of about 2000 on Wachusett Mountain to about 370 downstream of Wachusetts Reservoir. Geology within the Stillwater River Subwatershed is predominantly basalt or schist bedrock overlain by 10 to 25 feet of glacial till or englacial drift, with some outwash sand and gravel.

Thirty-one potential reservoir sites and four existing reservoirs were studied. Preliminary design summaries are included for 25 potential sites that met study criteria.

SITE NA-0601

Location:

On a tributary to Paradise Pond approximately 3100 feet upstream from Route 31 in Westminster, Massachusetts.

Fitchburg, Massachusetts Quadrangle.

Latitude: 42°31'00" Longitude: 71°51'58"

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area. (197 acres); therefore, no further investigations were made.

Location:

On a tributary to East Wachusett Brook approximately 100 feet upstream from Myrick Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°28°22" Longitude: 71°52'27"

Facilities Affected:

Below Elevation 970 400 feet of underground telephone cable.

Geologic Condition:

The left abutment is silty sand glacial till at high elevations with a gravel terrace at low elevations. The right abutment is silty sand glacial till with a gravel terrace at low elevations. Both abutments are probably shallow to bedrock. Depth to basalt bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems low on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be fair to good provided cutoff is made beneath gravel terrace on both abutments to either glacial till or bedrock.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0603

Location:

On a tributary to East Wachusett Brook approximately 3100 feet upstream from East Princeton Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°28'13" Longitude: 71°52'15"

Facilities Affected:

Below Elevation 965
5 houses
4 sheds
2 houses
3 sheds
1650 feet of Myrick Road
960 feet of Myrick Road

600 feet of Myrick Road 960 feet of Myrick Road 600 feet of East Beaman Road Road

SITE NA-0603 (Cont'd)

Geologic Conditions:

Both abutments are silty sand glacial till or poorly graded sand and gravel englacial drift, very shallow to bedrock. There are numerous outcroppings of basaltic bedrock at the higher elevations.

Depth to basalt bedrock in the foundation is not known, but may be 5 to 15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0604

Location:

On Babcock Brook approximately 2900 feet downstream from Sterling Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'43" Longitude: 71°51'58"

Facilities Affected:

No facilities affected below elevation 935.

Geologic Conditions:

The left abutment is granitic bedrock at high elevations and poorly graded sand and gravel englacial drift -- estimated 30 percent boulders. The right abutment is englacial drift along the stream and silty sand and glacial till at high elevations -- probably very shallow to bedrock. Depth to basaltic bedrock in the foundation is not known, but may be shallow. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Babcock Brook approximately 400 feet upstream from Route 62 in Princeton,

Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'35"

Longitude: 71°50'52"

Facilities Affected:

No facilities affected below elevation 705.

Geologic
Conditions:

Both abutments are glacial till, shallow to bedrock. There are swamp deposits at the toe of both abutments. Depth to bedrock is not known, but may be 20 feet. There are leakage problems in the foundation. Waterholding capabilities appear good.

SITE NA-0606

Location:

On Babcock Brook approximately 1000 feet southeast of West Sterling Cemetery in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'38" Longitude: 71°50'03"

Facilities
Affected:

Below elevation 660 1650 feet of Bullard Road

Below elevation 655 1185 feet of Bullard Road

Below elevation 650
720 feet of Bullard Road

Geologic Conditions:

Both abutments are silty sand glacial till probably shall to bedrock, with 50 percent boulders and cobbles. There are swamp deposits at toe of both abutments. Depth to basalt bedrock in the foundation is not known, but may be 10 to 20 feet. There are leakage problems in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 50 to 60 percent. Waterholding capabilities appear good.

SITE NA-0606 (Cont'd)

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Waterholding capabilities appear good providing a cutoff is made beneath the swamp in the foundation. Preliminary structure designs indicate that a concrete emergency spillway (chute or drop structure) may be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 5% of the site is owned by the Town of Princeton.

SITE NA-0607

Location:

On Justice Brook approximately 1800 feet upstream from Route 140 in Sterling, Massachusetts. A small section near the dam is in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°28'19" Longitude: 71°49'41"

Facilities Affected:

Below elevation 655

5 houses

8 barns and sheds

1 farm

2700 feet of Justice Hill Road cutoff 2200 feet of Justice Hill Road

Below elevation 645

4 houses

8 barns and sheds

l farm

2700 feet of Justice Hill Road cutoff 2200 feet of Justice Hill Road

Below elevation 630

2 houses

l barn

1200 feet of Justice Hill Road cutoff 700 feet of Justice Hill Road

Below elevation 620

1 house

600 feet of Justice Hill Road cutoff

400 feet of Justice Hill Road

SITE NA-0607 (Cont'd)

Geologic Conditions:

Both abutments are poorly graded sand and gravel englacial drift or silty sand glacial till -- probably shallow to basalt bedrock. Depth to basaltic bedrock in the foundation is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 15% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-0608

Location:

On the Stillwater River approximately 2400 feet upstream from Houghton Road in Princeton, and Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'31" Longitude: 71°49'25"

Facilities
Affected:

About 1.7 miles of Redemption Rock Trail (Route 140).

Geologic Conditions:

The left abutment is poorly graded sand and gravel englacial drift or silty sand glacial till with swamp at low elevations. The right abutment is poorly graded sand and gravel glacial till with swamp at low elevations. Both abutments are probably shallow to bedrock. There are basaltic rock outcroppings in the western-most stream. There are leakage problems in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

SITE NA-0608 (Cont'd)

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Waterholding capabilities appear fair depending on a cutoff through the swamp deposits in the foundation. There is a seep high on the right abutment which may need to be drained.

Preliminary structure designs indicate that a concrete chute emergency spillway will be needed to avoid excessive velocity in an excavated emergency spillway.

NA-0609 -- HYCREST POND

Location:

On Rocky Brook, 200 feet upstream of Upper North Row in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Surface Area (Acres)
91

Drainage	Area	a
(Acres)	(Sq.	Mi.)
474	0	.74

Potential for Expansion:

Small drainage area limits expansion.

Remarks:

This is an earth-fill dam. Spillway system is a cast iron pipe and an over-flow weir section. The weir is about 10 feet wide and 5 feet deep. Spillway is in fair condition. The dam has many trees growing on the slopes.

Location:

On Rocky Brook approximately 2700 feet downstream from Justice Hill Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'48"

Longitude: 71°48'03"

Facilities Affected:

Below elevation 690

Below elevation 670

1 house

2 barns

3 barns

980 feet of Justice Hill

4800 feet of Justice Hill Road

Road

2150 feet of power lines

2150 feet of power lines

Below elevation 680

1 house

2 barns

4800 feet of Justice Hill Road

2150 feet of power lines

Geologic Conditions:

The left abutment has basalt outcrops at high elevations, and schist and basalt bedrock outcrops and gravel terrace at low elevations. The right abutment has basalt and schist bedrock outcrops at high elevations and gravel terrace and swamp at low elevations. Depth to basalt and/or schist bedrock in the foundation is not known, but may be 10 to 20 feet. There are leakage problems low on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities appear to be good providing cutoff is made to bedrock beneath the gravel terraces and swamps low on both abutments.

Location:

On Rocky Brook approximately 2200 feet upstream from Beaman Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°27'16"

Longitude: 71°47'50"

Facilities Affected:

Below elevation 615

1 house

2150 feet of underground telephone cable

1 shed

Below elevation 600

1 house

1900 feet of underground telephone cable

1 shed

Below elevation 580

1 house

1100 feet of underground telephone cable

1 shed

Geologic Conditions:

Both abutments are silty sand glacial till, very shallow to bedrock. There are numerous outcrops of basalt and schist at middle and high elevations. Depth to basalt bedrock in the foundation is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Stillwater River approximately 3400 feet upstream from Route 62 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'34" Longitude: 71°48'42"

Facilities Affected:

Below elevation 470

3 houses

3 garages and sheds 3700 feet of power lines 2000 feet of Route 140 1000 feet of Beaman Road

Below elevation 450

1 house

3 garages and sheds 3700 feet of power lines 1900 feet of Route 140

Geologic Conditions:

Both abutments are silty sand (SM) glacial till at high elevations, with outcrops of Basaltic bedrock. Right abutment is poorly graded sand and gravel, outwash sand and gravel terrace and swamp at lower elevations. Left abutment is outwash and swamp at lower elevations. Depth to bedrock in foundation is not known, but probably shallow 10 to 20 feet to basalt bedrock. Leakage problems on both abutments and foundation. Impervious borrow was not located on site. Waterholding capability is poor.

Engineering Notes:

Recommended location for an excavated emergency spillway is at the right abutment. Preliminary structure designs indicate that a concrete chute emergency spillway will be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 10% of the site is owned by the Metropolitan District Commission. Two percent of the site is owned by the Town of Sterling.

Location:

On Scanlon Brook approximately 5200 feet upstream from Route 140 in Sterling,

Massachusetts.

Sterling, Massachusetts Quadrangle,

Latitude: $\mu^{0}24'57''$

71⁰49116" Longitude:

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area (196 acres); therefore, no further investigations were made.

SITE NA-0614

Location:

On Scanlon Brook approximately 1100 feet upstream from Route 140 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'34"

Longitude: 71048142"

Facilities Affected:

No facilities affected below elevation 590.

Geologic Conditions:

Both abutments are silty sand glacial till, shallow to bedrock, with outcrops of basaltic bedrock high on the left abutment. Depth to basalt bedrock in the foundation is not known, but may be 10 to 20 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Tannery Brook approximately 3000 feet upstream from Route 62 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°26'32" Longitude: 71°46'21"

Facilities Affected:

Below elevation 625

2 houses 1 shed

1700 feet of an unnamed road

Below elevation 615

1 house

1700 feet of an unnamed road

Geologic Conditions:

The right abutment is silty sand glacial till with numerous outcroppings of schist and basalt at all elevations. The left abutment is silty sand glacial till with schist and basalt outcrops at high elevations and poorly graded sand and gravel terrace and swamp at low elevations. There are leakage problems dow on the left abutment and at the swamp on the left of the stream. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Waterholding capabilities appear good providing a cutoff is made to either glacial till or bedrock beneath the swamp and the gravel terrace low on the left abutment.

Location:

On Tannery Brook approximately 1100 feet upstream from Jewett Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°25'34" Longitude: 71°46'32"

Facilities Affected:

Below Elevation 510

Below Elevation 470

1 house

6 houses

2 barns

1 shed

rock crushing plant fuel oil company

900 feet of Princeton Road (Route 62)

475 feet of Jewett Road

Below Elevation 495

2 houses

2 barns
rock crushing plant
fuel oil company
475 feet of Jewett Road

Geologic Conditions:

The left abutment is basaltic rock with a gravel terrace and swamp at low elevations. The right abutment is basaltic rock at the surface and at high elevations, with gravel terrace and swamp at low elevations. Depth to basaltic bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the gravel terrace on both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good providing a cutoff is made through the gravel terrace and swamp low on both abutments.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On a tributary to Waushaccum Brook approximately 1200 feet upstream from Route 12 in West Boylston, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°23'40" Longitude: 71°46'02"

Facilities Affected:

Below Elevation 470

10 houses

4 barns

600 feet of power lines

1800 feet of Fairbanks Street

Below Elevation 460

3 houses

4 barns

600 feet of power lines

1800 feet of Fairbanks Street

Below Elevation 455

1 house

4 barns

450 feet of Power lines

1000 feet of Fairbanks Street

Geologic Conditions:

The right abutment is silty sand glacial till with outcrops of basalt and schist and swampy at low elevations. The left abutment is basalt and schist with poorly graded sand and gravel outwash and swampy at low elevations. Depth to basalt or schist bedrock in the foundation is not known, but is probably 10 to 20 feet. There are leakage problems in the foundation and low on the left abutment. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to good providing a positive cutoff can be made to either glacial till or bedrock beneath the swamp in the foundation and low on the left abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Malden Brook approximately 150 feet upstream from Malden Street in West Boylston, Massachusetts.

Worcester North, Massachusetts Quadrangle.

Latitude: 42°22'17"

Longitude: 71°47'58"

Facilities
Affected:

Below elevation 580

14 houses

1 barn

1250 feet of Goodale Street

Below elevation 570

5 houses

l barn

550 feet of Goodale Street

Below elevation 560

1 house

100 feet of Goodale Street

Geologic Conditions:

Both abutments are outwash sand and gravel at the toe of the slopes with silty sand glacial till high on the slopes. Depth to schist bedrock in the foundation is not known, but may be 30 to 35 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 15 percent. Waterholding capabilities appear fair.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities may be good if a cutoff can be made to glacial till or bedrock.

Public Ownership:

The Metropolitan District Commission controls water rights on this stream.

Location:

On South Meadow Brook approximately 400 feet upstream from Fitch Pond Road in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°25'08" Longitude: 71°43'54"

Remarks:

Drainage Area -- 725 Acres.
This site did not meet criteria for this study.
At the 10 to 1 drainage area to pond area ratio,
the depth at dam is less than 7 feet and storage
less than 100 acre feet; therefore, no further
investigations were made.

SITE NA-0620

Location:

On a tributary to South Meadow Pond approximately 400 feet upstream from end of pond in Clinton, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°25'08" Longitude: 71°42'54"

Facilities Affected:

Below elevation 380

4 houses

3 barns

1 shed

525 feet of Chace Hill Road 1200 feet of Moffet Road

Below elevation 375

1 house

l barn

400 feet of Chace Hill Road 1200 feet of Moffet Road

SITE NA-0620 (Cont'd)

Geologic Conditions:

The right abutment is silty sand glacial till at high elevations and swamp at toe of abutment. The left abutment is poorly graded sand and gravel at high elevations and swamp at low elevations. Depth to bedrock in the foundation is unknown. There are leakage problems in the foundation and the left abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear poor because of the outwash on the left abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0621

Location:

At South Meadow Pond approximately 500 feet downstream from Meadow Road Causeway in Clinton, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°24'52"

Longitude: 71⁰42'32"

Facilities Affected:

Below Elevation 370

7 cottages

1 barn 1 shed

3000 feet of Meadow Road

Below Elevation 340

6 cottages 1 shed

3000 feet of Meadow Road

Below Elevation 350

7 cottages

1 shed

3000 feet of Meadow Road

Below Elevation 330

4 cottages

3000 feet of Meadow Road

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

On Houghton Brook approximately 1150 feet upstream from Route 140 in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°24'45" Longitude: 71°48'12"

Facilities Affected:

Below Elevation 495

- 2 houses
- 3 garages
- 1 shed
- 2 barns

Below Elevation 490

- 2 houses
- 1 shed
- 1 garage

Geologic
Conditions:

The left abutment is silty sand glacial till at high elevations and poorly graded sand and gravel outwash and swamp at low elevations. The right abutment is poorly graded sand and gravel and swamp at low elevations. Depth to granitic bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear poor due to swamp across the foundation and outwash sand and gravel low on the left abutment and on the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0623

Location:

On Bailey Brook approximately 400 feet upstream from Beaman Road in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Latitude: 42°27'04" Longitude: 71°48'27"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area (215 acres); therefore, no further investigations were made.

NA-0624 -- STUART POND

Location:

Near Justice Hill Road cutoff in Sterling, Massachusetts.

Sterling, Massachusetts Quadrangle

Surface	Area
(Acr	res)
	36

Height of (Ft.)	Dam
12	

Drainage	Area			
(Acres)		(Sq.	Mi.)
2570		4.	02	

Potential for Expansion:

Could be expanded.

Remarks:

This is an old mill dam in poor condition; downstream slope is a vertical stone wall. The outlet structure, located south of Justice Hill Road is a 12-inch diameter pipe with a gate. Seepage through the dam was noted.

Geologic Conditions:

Both abutments are silty sand glacial till. There is a slightly swampy area 30 feet up on the right abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear good.

Location:

On Gates Brook approximately 500 feet upstream from Woodland Street in West Boylston, Massachusetts.

Worcester, North, Massachusetts Quadrangle.

Latitude: 42°20'26"

Longitude: 71°47'39"

Facilities Affected:

This site was eliminated from further study due to excessive facilities affected. (Quabbin Aqueduct)

Geologic Conditions:

The right abutment is silty sand glacial till with swamp at low elevations. The left abutment is silty sand glacial till with outcrops of schist at high elevations and swamp at low elevations. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Waterholding capabilities appear poor due to outwash sand and gravel and swamps on both abutments and the foundation.

SITE NA-0626

Location:

On Bartlet Pond Brook approximately 350 feet downstream from Elm Street in Leominster, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°29'50" Longitude: 71°49'17"

Facilities Affected:

Below elevation 775

5 houses 1 barn

l sports club l skeet house

2300 feet of Wachusett Street

3850 feet of Elm Street

SITE NA-0626 (Cont'd)

Facilities
Affected:
(Cont'd)

Below elevation 765

4 houses
1 barn

l sports club
l skeet house

2300 feet of Wachusett Street

3850 feet of Elm Street

Below elevation 760

l house l barn

3850 feet of Elm Street

950 feet of Wachusett Street

Geologic Conditions:

Both abutments are silty sand glacial till, probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 40 percent. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 60% of the site is owned by the City of Leominster.

SITE NA-0627

Location:

On Keyes Brook approximately 2700 feet upstream from Hobbs Road in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Latitude: 42°29'46" Lo

Longitude: 71°51'20"

Facilities Affected:

Below elevation 830

2 houses 2000 feet of Route 140 5000 feet of Fitchburg Road

Paradise Pond

Below elevation 820

1 house

2000 feet of Route 140

5000 feet of Fitchburg Road

Paradise Pond

SITE NA-0627 (Cont'd)

Geologic Conditions:

Both abutments are englacial drift with a thin gravel terrace. Depth to schist bedrock in the foundation is not known, but may be 30 to 40 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site, but contains cobbles and boulders. Waterholding capabilities appear fair to poor depending on the extent of the outwash terrace gravel.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 90% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-0628

Location:

On Goodridge Brook approximately 700 feet upstream from Sterling Street in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°26'22" Longitude: 71°43'13"

Facilities Affected:

Below Elevation 455

1 house 1 garage

1000 feet of Wiles Road

Geologic Conditions:

Both abutments are silty sand glacial till probably shallow to schist bedrock. There is a swamp low on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the foundation on the left side of the stream. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 20 percent. Waterholding capabilities appear good, provided a cutoff can be made to glacial till beneath the swamp area low on the left abutment.

SITE NA-0628 (Cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0629

Location:

On Goodridge Brook approximately 1200 feet from Fuller Pond in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°26'12" Longitude: 71°41'30"

Facilities Affected:

Below Elevation 340 8 houses

Below Elevation 335 2 houses

Geologic Conditions:

The right abutment is poorly graded sand kame deposits and poorly graded sand and gravel outwash. The left abutment is poorly graded sand and gravel with swamp at lower elevations. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash on both abutments and the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On South Meadow Brook approximately 1600 feet upstream from South Meadow Pond in Sterling, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°24'37" Longitude: 71°43'12"

Facilities Affected:

No facilities affected below elevation 380.

Geologic Conditions:

The left abutment is poorly graded sand and gravel outwash with schist at the highest elevations and swamp at the low elevations. The right abutment is poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor because of outwash on both abutments.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

This site is owned by the Metropolitan District Commission.

NA-0631 -- WEST WAUSHACCUM POND

Location:

Near Gates Road in Sterling, Massachusetts

Sterling, Massachusetts Quadrangle

Latitude: 42°24'36" Longitude: 71°45'54"

Surface Area (Acres)

Drainage Area (Acres) 3280

Potential for

Expansion: Limited by cottages, railroad, and powerlines

Remarks:

The outlet for East Waushaccum Pond passes under Newell Hill Road into West Waushaccum Pond. The outlet at West Waushaccum is two 48 inch culverts under Gates Road. The road acts as a dam. No photos were taken.

SITE NA-0632

Location:

At outlet to Scotland Swamp approximately 800 feet upstream from French Brook in Boylston, Massachusetts.

Shrewsbury, Massachusetts Quadrangle

Latitude: 42°21'50" Longitude: 71°42'39"

Engineering Notes:

This site did not meet criteria for this study due to the small contributing drainage area, (119 acres); therefore, no further investigations were made.

Location:

On a tributary to French Brook approximately 200 feet upstream from Linden Street in Boylston, Massachusetts.

Shrewsbury, Massachusetts Quadrangle

Latitude: 42°20'41" Longitude: 71°42'42"

Facilities Affected:

Below Elevation 525

1 house

Below Elevation 515
1000 feet of Linden Street

1500 feet of Linden Street

Below Elevation 520

1 house
Below Elevation 510
625 feet of Linden Street
1375 feet of Linden Street

Geologic Conditions:

The right abutment is hornblende-biotite gneiss bedrock overlain by silty sand glacial till, poorly sorted sand and gravel outwash, and swamp at low elevation. The left abutment is poorly graded sand and gravel outwash, probably shallow to bedrock, with swamp at low elevations and glacial till at higher elevations. Depth to hornblende-biotite gneiss bedrock is not known, but may be 15 to 25 feet. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to poor due to outwash sand and gravel on the left abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0634

Location:

On French Brook approximately 500 feet upstream from Main Street in Boylston, Massachusetts.

Shrewsbury, Massachusetts Quadrangle

Latitude: 42°22'03" Longitude: 71°43'24"

SITE NA-0634 (Cont'd)

Facilities Affected:

Below Elevation 500 13 houses 1 shed 2 swimming pools 500 feet of Cross Street 650 feet of Linden Street Below Elevation 495 10 houses 2 swimming pools 425 feet of Cross Street 425 feet of Cross Street

Below Elevation 490

2 houses

350 feet of Cross Street

Geologic Conditions:

Both the abutments are silty sand glacial till, probably shallow to bedrock, with swamp at low elevation. Depth to phyllite bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run to 20 percent. Waterholding capabilities appear good provided a cutoff is made to glacial till beneath the swamp in the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 20% of the site is owned by the Metropolitan District Commission.

NA-0635 -- PARADISE POND

Location:

On Keyes Brook near the intersection of Routes 140 and 31 in Princeton, Massachusetts.

Sterling, Massachusetts Quadrangle.

Surface Area	Height of Dam	Drainage A	Area
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
61	10	1285	2.0

Potential for

Expansion:

See data for potential site NA-0627 which is about 900 feet downstream.

Remarks:

This is an old mill dam with a stone retaining wall at the downstream slope. The spillway is a 6 foot wide rock chute over the dam. The dam has washed out at the left side. Entire structure is in poor condition.

NA-0636 -- BARTLETT POND

Location:

Near Elm Road and Wachusett Street in Leominster, Massachusetts.

Sterling, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage	Area
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
20	15	973	1.52

Potential

for

Expansion:

Expansion is possible, but extensive diking

would be required.

Remarks:

The dam is a concrete weir with a 12 foot wide, 3 foot deep weir spillway. Flows discharge

onto a stone masonry ramp.

NA-0637 -- WACHUSETT RESERVOIR

Location:

In the southwest corner of Clinton,

Massachusetts.

Clinton, Massachusetts Quadrangle.

Surface Area
(Acres)

Height of Dam (Ft.)

Drainage Area (Acres) (Sq. Mi.)

4135

114

69,120 108

Potential

for

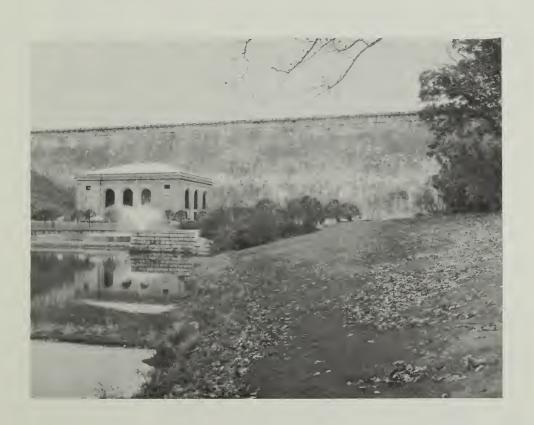
Expansion:

The site appears to be developed to its full

potential.

Remarks:

Wachusett Reservoir is part of the Metropolitan District Commission system providing water for communities in the Boston area. The structure is a large granite block dam. There is a 450 foot long overflow weir at the left abutment.



NA-0638 -- COACHLACE POND

Location:

West of Route 110 in Clinton,

Massachusetts.

Clinton, Massachusetts Quadrangle

Surface (Acre	
	9*

Drainag	e Area
(Acres)	(Sq. Mi.)
2571	4.02

Potential for

Expansion:

Limited by the Boston and Maine Railroad

along the north shore.

Remarks:

The structure consists of a concrete weir section with four bays. The outlet channel is about 25 feet wide and 15 feet deep. Overall condition of the structure and channel is poor. The structure appears to control water levels in South Meadow Pond and Mossy Pond.

^{*} Area of South Meadow, Mossy, and Coachlace Ponds

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

ST STORGE COST * TO CHANGE COST * COST * CHANGE COST * COST * CHANGE COST * COST * CHANGE COST * COST * CHANGE COST * COST * CHANGE COST * CO	COST COST/ DEPTH * CREST AC FER AT * ELEV AC FT AC DAM *+ TYPE (\$) (FT) * (MSL) (**) (FT) * (MSL) (**) (FT) * (MSL) (**) (**) (**) (**) (**) (**) (**) (*	AT CREST PER AC FT IN (\$) ***********************************		A H # A 222000 # 1	*****
Color	AC FT AC DAM *+ TYPE (\$) (\$) (\$) (\$) (\$) (\$) (\$) (\$) (\$) (\$)	AC FT IN (\$) ************************************		A A A B B B B B B B B B B B B B B B B B	*** *******
L) AC FT IN (F) * (MSC) CS QUAD—STERLING MASS LATITUDE 42-28-22 LONGITUDE 71-52-27 YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 314 CFS 3.3 E 456 4.6 1360 * 955.5 42 * 956.9 24 60 * 0.27 7.5 E 630 6.6 1120 * 955.5 42 * 956.9 24 60 * 0.27 7.5 E 630 6.6 1120 * 955.5 42 * 956.9 33 121 * 0.74 1.5 F 825 8.6 1180 * 967.9 61 * 966.9 33 121 * 0.74 1.5 F 826 9.0 1190 * 967.9 61 * 966.9 36 147 * 0.94 2.5 T 868 9.0 1190 * 967.9 61 * 966.9 36 147 * 0.94 2.5 T 868 9.0 1190 * 967.9 61 * 966.9 36 147 * 0.94 2.5 F 868 9.0 1190 * 967.9 61 * 966.9 36 147 2.5 F 868 9.0 1190 * 967.9 61 * 966.9 36 147 2.5 F 868 9.0 1190 * 967.9 61 * 966.9 36 147 2.5 F 868 9.0 1190 * 967.9 61 * 966.9 36 140 * 0.94 2.5 F 868 9.0 1190 * 967.9 61 * 966.9 36 147 2.5 F 868 9.0 1190 * 967.9 52 * 952.0 32 2.5 F 8713 4.6 1860 * 955.0 73 * 957.0 37 2.5 F 8713 1.3 990 * 966.0 107 * 966.1 49 2.5 F 8713 1.3 990 * 966.0 107 * 966.1 49 2.5 F 8713 1.3 990 * 967.0 107 * 966.1 49 2.5 F 8714 SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 174 CFS 2.5 F 872 1.3 170 * 897.0 31 * 898.8 19 6 * ****** 2.5 F 873 1.3 990 * 967.0 31 * 898.8 19 6 * ****** 2.5 F 873 1.3 990 * 967.0 31 * 990.5 52 16 * 0.21 2.5 F 873 1.3 990 * 967.0 31 * 990.5 52 16 * 0.45 2.5 F 873 1.3 170 * 897.0 31 * 898.8 19 6 * ******* 2.5 F 873 1.3 170 * 897.0 31 * 898.8 19 6 * ********************************	(\$) (AC) (\$) (FT) * (MSL) ***********************************	AC FT IN (\$) ***********************************		H * A 0'00000 * ;	** ******
GS QUAD- STERLING MASS 1.9 E 398 4.1 1410 * 954.0 41 * 956.5 22 53 * 45 54.6 1360 * 955.5 42 * 957.9 24 60 * 60 1360 * 955.5 42 * 957.9 24 60 * 61 20 6.6 1120 * 959.8 47 * 962.0 28 86 * 61 20 6.6 1120 * 959.8 47 * 962.0 28 86 * 61 20 6.6 1120 * 967.9 61 * 969.0 35 140 * 62.5 1 868 9.0 1190 * 967.9 61 * 969.0 35 140 * 62.5 1 868 9.0 1190 * 967.3 60 * 969.0 35 140 * 62.5 1 868 9.0 1190 * 967.3 60 * 969.0 35 140 * 62.5 1 868 9.0 1190 * 967.3 60 * 969.0 35 140 * 62.5 1 868 9.0 1190 * 967.9 61 * 969.0 35 140 * 62.5 1 868 9.0 1190 * 967.0 10 * 969.0 35 140 * 62.5 1 860 * 960.9 95 * 962.9 43 108 * 62.5 E 697 6.8 1860 * 950.9 95 * 962.9 43 108 * 62.5 E 697 6.8 1860 * 950.9 95 * 962.9 43 108 * 62.5 E 697 6.8 1772 17.5 730 * 967.0 107 * 969.1 49 157 * 62.5 E 697 6.8 1770 * 967.0 107 * 969.1 49 157 * 62.5 E 697 6.8 1772 17.5 730 * 967.0 107 * 969.1 49 157 * 62.5 E 697 6.8 1772 17.5 730 * 967.0 107 * 969.1 49 157 * 62.5 E 153 11.3 990 * 967.0 107 * 969.1 170 * 897.0 1170 * 897.0 1170 * 897.0 1170 * 897.0 1170 * 897.0 1170 * 897.0 1170 * 996.0 17 * 913.0 170	STREAM WATER QUALITY (A) 100-YR I 5TREAM WATER QUALITY (A) 100-YR I 6210 23 26440 8.8 * 953.3 2560 35 20240 15.0 * 957.5 1500 43 19120 21.7 * 962.3 1200 50 19540 27.5 * 961.5 1210 51 20200 28.5 * 962.5 1210 51 20200 28.5 * 962.5 STREAM WATER QUALITY (A) 100-YR I 8800 20 43960 18.1 * 947.5 1230 78 14710 36.0 * 958.5 1230 78 14710 36.0 * 958.5 1230 78 14710 36.0 * 958.5 STREAM WATER QUALITY (A) 100-YR I 5 2.7 * 895.5 1420 20 20110 10.8 * 893.3 1420 36 13610 19.6 * 910.5 590 61 11680 36.7 * 919.1	QUAD- STERLING MASS PRIN SPWY DESIGN STO E 398 4.1 1410 E 456 4.6 1360 E 630 6.6 1120 E 857 8.8 950 T 922 8.4 1150		A SOSSES	U ********
1.9 E 398 4.1 1410 * 954.0 41 * 956.5 22 22 63 * 33 3 3 4	7 2.9 * 951.9 6210 23 26440 8.8 * 953.3 2560 35 20240 15.0 * 957.5 1500 43 19120 21.7 * 962.3 1200 51 20200 28.5 * 961.5 1210 51 20200 28.5 * 962.5 1210 51 20200 28.6 * 962.5 1230 MI = 1216 AC USGS 2380 48 21590 28.0 * 977.5 850 98 13050 42.5 * 965.0 850 20 43960 18.1 * 948.5 1230 78 14710 36.0 * 958.5 850 98 13050 42.5 * 965.0 87REAM MATER QUALITY (A) 100-YR I 850 98 13050 42.5 * 965.0 87REAM MATER QUALITY (A) 100-YR I 850 36 13050 42.5 * 965.0 87REAM MATER QUALITY (A) 100-YR I 850 20 20110 10.8 * 893.3 1420 36 13610 19.6 * 910.5 890 52 11320 28.0 * 910.5	E 456 4.6 E 630 6.6 E 857 8.8	954.0 955.5 959.8 964.6 967.9	956.5 2 957.9 2 962.0 2 966.8 3 969.9 3 969.0	
3.3 E 456 4.6 1360 # 955.5 42 # 957.9 24 60 # 7.5 E 630 6.6 1120 # 959.8 47 # 962.0 28 86 86 82 82 8 86 8 92.0 6.6 1120 # 967.9 61 # 969.9 36 121 # 71.5 T 868 9.0 1190 # 967.9 60 # 969.0 35 140 # 967.9 62 8 96.8 121 # 962.0 28 86 8 9.0 1190 # 967.9 60 # 969.0 35 140 # 962.0 28 86 8 9.0 1190 # 967.9 60 # 969.0 35 140 # 962.0 180 # 962.0 180 # 969.0 35 140 # 962.0 180 # 962.0 1	2560 23 26440 8.8 # 953.3 2560 35 20240 15.0 # 957.5 1500 43 19120 21.7 # 962.3 1200 50 19540 27.5 # 961.5 1210 51 20200 28.5 # 962.5 1210 51 20200 28.5 # 962.5 STREAM WATER QUALITY (A) 100-YR I 8800 20 43960 18.1 # 948.5 2380 48 21590 28.0 # 947.5 850 98 13050 42.5 # 965.0 87REAM WATER QUALITY (A) 100-YR I 850 20 20110 10.8 # 893.3 1420 36 13610 19.6 # 902.0 810 52 11320 28.0 # 910.5	E 456 4.6 E 630 6.6 E 857 8.8	955.5 959.8 964.6 967.9 967.3	957.9 2 962.0 2 966.8 3 969.9 3 969.0 3	* * * * * *
7.5 E 650 0.6 1120 0 959.8 47 962.0 28 86 85 121 0 15 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2560	857 8.8	959.8	966.8 966.8 969.9 969.0 969.0 42-28-13	• • • • •
1.5 T 862 8.6 1180 9 967.9 61 969.9 36 147 8 0.94 2.5 T 868 9.0 1190 8 967.3 60 8 969.0 35 140 8 0.96 ES QUAD—STERLING MASS T.5 E 421 4.1 1990 8 949.5 52 8 952.0 32 51 8 8 8 8 8 8 8 8 1.03 ES QUAD—STERLING MASS T.5 E 421 4.1 1990 8 960.9 95 8 952.0 37 74 8 0.68 E.5 E 697 6.8 1470 9 950.9 95 8 952.0 37 74 8 0.68 E.5 E 697 6.8 1470 9 950.9 95 8 962.9 43 108 8 1.03 E.5 E 697 6.8 1470 9 950.9 95 8 962.9 43 108 8 1.03 E.5 E 697 6.8 1470 9 967.0 107 8 969.1 49 157 8 1.30 ESS QUAD—STERLING MASS E 172 17.5 730 8 967.0 107 8 962.9 43 108 8 1.03 ESS E 221 4.1 1710 8 897.0 31 8 898.8 19 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	1200 50 19540 27.5 # 961.5 1210 51 20200 28.5 # 962.5 1210 51 20200 28.5 # 962.5 DA= 1.90 SQ MI = 1216 AC USGS STREAM WATER QUALITY (A) 100-YR I 2380 48 21590 28.0 # 947.5 850 98 13050 42.5 # 965.0 850 98 13050 42.5 # 965.0 STREAM WATER QUALITY (A) 100-YR I 5 2.7 # 895.5 1420 20 20110 10.8 # 893.3 1420 36 13610 19.6 # 910.5	8 7 C B	967.9	969.9 969.0 969.0 42-28-13	
2.5 T 868 9.0 1190 + 967.3 60 + 969.0 35 140 + 8***********************************	1210 51 20200 28.5 * 962.5 5 * 962.5	•	967.3	969.0 3	* *
GS QUAD— STERLING MASS T.5 E 421 4.1 1990 * 949.5 52 * 952.0 32 51 * * * * * * * * * * * * * * * * * *	DA= 1.90 SQ MI = 1216 AC USGS (STREAM WATER QUALITY (A) 100-YR (ST	T 868 9.0	*******	42-28-13	***
7.5 E 421 4.1 1990 * 949.5 52 * 952.0 32 51 * ***** 8.5 E 473 4.6 1860 * 950.9 57 * 953.1 33 56 * 0.27 8.5 E 477 4.6 1860 * 950.9 57 * 953.1 33 56 * 0.27 8.5 E 1153 11.3 990 * 967.0 107 * 969.1 49 157 * 1.30 8.5 E 1153 11.3 990 * 967.0 107 * 969.1 49 157 * 1.30 8.5 E 1153 11.3 990 * 967.0 107 * 969.1 49 157 * 1.30 8.5 E 1153 11.3 990 * 967.0 107 * 969.1 49 157 * 1.30 8.6 E 1153 11.3 990 * 967.0 107 * 969.1 49 157 * 1.30 8.7 E 221 4.1 1710 * 897.0 31 * 898.8 19 6 * ***** 5.5 E 221 4.1 1710 * 897.0 31 * 898.6 17 5 * 0.21 2.0 E 453 8.5 1080 * 904.0 44 * 905.5 25 16 * 0.45 9.1 E 1374 25.7 520 * 920.6 65 * 922.1 44 8.5 E 1374 25.7 520 * 920.6 65 * 922.1 44 BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. CHUTE, DECONCRETE SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. FIGURATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.		011AD- STERLING	I ATIT		F 71-52-1
7.5 E 421 4.1 1990 * 949.5 52 * 952.0 32 51 * 8 8.5 E 473 4.6 1860 * 950.9 57 * 953.1 33 56 * 8 8.5 E 473 4.6 1860 * 950.9 57 * 953.1 33 56 * 8 8.5 E 1153 11.3 990 * 960.9 95 * 962.9 43 108 * 95.0 E 1772 17.5 730 * 967.0 107 * 969.1 49 157 * 8 8.5 E 1153 11.3 990 * 967.0 107 * 969.1 49 157 * 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		SPWY DESIGN	RUNO	.10 IN, PEAK	332 CFS
8.5 E 473 4.6 1860 8 950.9 57 8 953.1 33 56 8 6.5 E 697 6.8 1470 8 955.0 73 9 957.0 37 7 4 8 953.1 33 56 8 6.5 E 697 6.8 1470 8 950.9 95 8 952.9 43 108 8 8 95.0 E 1772 17.5 730 8 960.9 95 8 969.1 49 157 8 8 95.0 E 1772 17.5 730 8 960.9 95 8 969.1 49 157 8 8 9810 8 98 8 19 6 8 95 8 96.6 17 8 95.5 E 221 4.1 1710 8 897.0 31 8 898.8 19 6 8 95.5 E 221 4.1 1710 8 897.0 31 8 896.6 17 5 8 8 95.6 17 5 8 8 95.6 17 5 8 8 95.6 17 5 8 8 95.6 17 5 8 8 95.6 17 8 8 95.6 17 8 8 95.6 17 8 8 95.6 17 8 8 95.6 17 8 8 95.6 17 8 8 95.6 18 8 95.5 25 16 8 95.6 18 8 95.6 18 95.0 18 8 95.5 25 16 8 95.6 18 95.0		7 167	* *	* *	* 1
2.5 E 697 6.8 1470 + 955.0 73 + 957.0 37 74 + 0.68 8.5 E 1153 11.3 990 + 960.9 95 + 962.9 43 108 + 1.03 5.0 E 1772 17.5 730 + 967.0 107 + 969.1 49 157 + 1.30 8.5 E 1153 11.3 990 + 960.9 95 + 962.9 43 108 + 1.03 8.6 QUAD— STERLING MASS LATITUDE 42—26—43 LONGITUDE 71—51—58 7.8 PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 174 CFS 8.5 E 221 4.1 1710 + 897.0 31 + 898.8 19 6 + ***** 8.5 E 221 4.1 1710 + 897.0 31 + 898.8 19 6 * ***** 8.6 E 221 4.1 1710 + 897.0 31 + 898.8 19 6 * ***** 8.7 E 153 3.0 2440 + 895.5 28 + 896.6 17 5 * 0.21 8.8 E 163 3.0 2440 + 895.5 28 + 896.6 17 5 * 0.81 8.9 E 453 8.5 1080 + 912.1 57 + 913.6 34 39 * 0.65 9.1 E 1374 25.7 520 + 920.6 65 + 922.1 44 89 * 0.83 1.1 E 1503 28.2 500 + 922.5 67 * 924.1 44 89 * 0.83 8.8 E 163 28.2 500 * 920.6 65 * 922.1 42 88 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		E 473 4.6	6-056	+ 953.1	: : :
8.5 E 1153 11.3 990 + 960.9 95 + 962.9 43 108 + 1.03 5.0 E 1772 17.5 730 + 967.0 107 + 969.1 49 157 + 1.30 8.6 E 1772 17.5 730 + 967.0 107 + 969.1 49 157 + 1.30 8.8 E 1772 17.5 730 + 967.0 107 + 969.1 49 157 + 1.30 8.8 E 1772 17.5 730 + 967.0 107 + 969.1 49 157 + 1.30 8.8 E 1772 17.5 7.5 E 17.5		E 697 6.8	* 955.0	* 957.0	*
5.0 E 1772 17.5 730 * 967.0 107 * 969.1 49 157 * **********************************		E 1153 11.3	6.096 *	* 962.9	*
6S QUAD- STERLING MASS YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 8.5 E 221 4.1 1710 * 897.0 31 * 898.8 19 6 * 83.3 E 163 3.0 2440 * 895.5 28 * 896.6 17 5 * 2.0 E 453 8.5 1080 * 904.0 44 * 905.5 25 16 * 39.5 E 858 16.1 680 * 912.1 57 * 913.6 34 39 * 39.5 E 1503 28.2 500 * 912.1 57 * 913.6 34 39 * 39.5 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 11.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 89 * 84 * 84 * 84 * 84 * 84 * 8		1112 11.5	0-/96 *	1.696 *	* *
GS QUAD- STERLING MASS VR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 4.5.5 E 221 4.1 1710 * 897.0 31 * 898.8 19 6 * 8.3.3 E 163 3.0 2440 * 895.5 28 * 896.6 17 5 * 2.0 E 453 8.5 1080 * 904.0 44 * 905.5 25 16 * 2.0 E 453 8.5 1080 * 904.0 44 * 905.5 25 16 * 39 * 39 * 30 * 31 E 1374 25.7 520 * 920.6 65 * 922.1 42 78 * 39 * 39 * 30 * 30 * 30 * 30 * 30 * 30	YR YR 33.3		*********	************	**********
YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 174 CF 5.5 E 221 4.1 1710 * 897.0 31 * 898.8 19 6 * * * * * * * * * * * * * * * * * *	AM WATER QUALITY (A) 100-YR 5 2.7 # 895.5 20 20110 10.8 # 893.3 36 13610 19.6 # 902.0 52 11320 28.0 # 910.5 61 11680 36.7 # 919.1	- STERLING MA		42-26-43	TUDE
5.5 E 221 4.1 1710 # 897.0 31 # 898.8 19 6 # # 83.3 E 163 3.0 2440 # 895.5 28 # 896.6 17 5 # 2.0 E 453 8.5 1080 # 904.0 44 # 905.5 25 16 # 30.5 E 858 16.1 680 # 912.1 57 # 913.6 34 39 # 30.5 E 858 16.1 680 # 912.1 57 # 913.6 34 39 # 30.5 E 1374 25.7 520 # 920.6 65 # 922.1 42 78 # 11.1 E 1503 28.2 500 # 922.5 67 # 924.1 44 89 # 11TERIA AND COST DATA. BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NON FORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES FIRM THE WHILE VARIATION ARE PRIMARILY FOR COMPARISON PURPOSES	5 2.7 * 89 20 20110 10.8 * 89 36 13610 19.6 * 90 52 11320 28.0 * 91 61 11680 36.7 * 91	SPWY DESIGN	RUNDFF	•10 IN.	= 174 CF
3.3 E 163 3.0 2440 * 895.5 28 * 896.6 17 5 * 2.0 E 453 8.5 1080 * 904.0 44 * 905.5 25 16 * 3.0 24.0 * 912.1 57 * 913.6 34 39 * 3.1 E 1374 25.7 520 * 920.6 65 * 922.1 42 78 * 3.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 888.8	20 20110 10.8 * 89 36 13610 19.6 * 90 52 11320 28.0 * 91 61 11680 36.7 * 91	221 4.1	• •	-	•
2.0 E 453 8.5 1080 * 904.0 44 * 905.5 25 16 * 0.5 E 858 16.1 680 * 912.1 57 * 913.6 34 39 * 39 * 9.1 E 1374 25.7 520 * 920.6 65 * 922.1 42 78 * 1.1 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 924.1 44 89 * 1.2 E 1503 28.2 500 * 922.5 67 * 92	36 13610 19.6 * 90 52 11320 28.0 * 91 61 11680 36.7 * 91	163 3.0	* 895.5 2	9*968 * 8	*
52 11320 28.0 # 910.5 E 858 16.1 680 # 912.1 57 # 913.6 34 39 # 81 11680 36.7 # 919.1 E 1374 25.7 520 # 920.6 65 # 922.1 42 78 # 83 11960 38.7 # 921.1 E 1503 28.2 500 # 922.5 67 # 924.1 44 89 # 84.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8.	52 11320 28.0 * 91 61 11680 36.7 * 91	453 8.5	0.406 *	* 905.5	*
9.1 E 1374 25.7 520 + 920.6 65 + 922.1 42 78 + 1.1 E 1503 28.2 500 + 922.5 67 + 924.1 44 89 + 1.2 E 1503 28.2 500 + 922.5 67 + 924.1 44 89 + 1.3 E 1503 28.2 500 + 922.5 67 + 924.1 44 1.4 Extra AND COST DATA. BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NON FORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES FIRM THE SHIM VARIATION ARE PRIMARILY FOR COMPARISON PURPOSES	61 11680 36.7 * 91	E 858 16.1	+ 912.1	* 913°6	
1.1 E 1503 28.2 500 + 922.5 67 + 924.1 44 89 + ************************************		E 1374 25.7	* 920.6	a 922.1	•
BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. SPILLMAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. SPILLMAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= ATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPORARE SHOWN IN HIE NEAREST OF THE THIR THIS SHOWN ARE THE	570 63 11960 38.7 a 921.1 ***********************************	E 1503 28.2 500	**********		
SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= ATA ARE BASED ON PRE-IMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOS ARE SHOWN IN THE NEAREST OF FORT THE SHOW ARE IN	SPILL MAY STORAGE AND COSTS ARE	AND COST	INCLUDING	VENEFICIAL POOL	
FORMATION. FIGURES SHOWN	SPILLWAY TYPE CODE- C=CONCRETE	UTE, D=CONCRETE DROP	1	O, T= TWO SPILLWAY	S. N= NONE
	NATA ARE BASED ON PRELIMINARY INFORMA	ALLON. P	AFTUEEN DEVEL	OBHENT ON V. AND	ARE NOT TO BE

100 1	ENEFIC	BENEFICIAL POOL *					EMERGENCY	RGENCY SPILLWAY + DESIGN + DAM + SAFE + YIELD + YIELD + YIELD	WAY	+ HIG	DESIGN HIGH WATER	ER *		DAM	***	* SAFE * YIELD	
STOO ACE	,	COST	ADEA	COST/	DEPTH		-	STORAGE	COST	* 4	V 12	* 400	* TOP	- 47	FILL	+PERCENT	ENT
NA N		Ħ		AC	DAM	*+ 17	TYPE	AI CRESI	AC FT	ដ • •				He He	(1000	*CHANCE	
AC FT	Z	(MSCI) AC TI IN (A) (AC) (B) (TI) to C TI TI TI TI TI TI TI TI TI TI TI TI TI	(AC)	(5)	(FT)	(HSL)		AC FT IN (5) + (MS)	(\$)	(NSC		(AC)	(MSL)	FT) (AC) + (ASL) デザ CY) + (AGD) ************************************	GDW) ((Q:
-0605 SITE RATING (3	(3)	DA= 2.10 SQ MI STREAM WATER	WATER	STREAM WATER QUALITY (A)	1344 AC ITY (A)	100-	USGS QUAD-	D- STERLI N SPWY DE	SPWY DESIGN STORM	IRM RL	LAT	ITUDE	LATITUDE 42-26-35 FF = 8-10 IN, PE	DE 42-26-35 LONGI 8-10 IN, PEAK FLOW	LONGITUDE C FLOW =	366 366	71-50-52 366 CFS
0	0.0		9		0.9	* *	685.8 E	465 4.1	1 4600	* 687	17.9	57 *	689.8	8 26	102	* * * * * * * * * * * * * * * * * * * *	
001	0.8	21720	47	90170	12.5		685.0 E	425 3.8	9 5110		687.4	56 +	0.689		96		0.28
	8.6	2380	187	30160	31.5								701.8		248		1.18
000	1001	1000	611	00002	26.5		103.0	7117 10°3	1370		0.00	* 971	.080	40	306		1 - 40
RATING (1)	10 (NA-0606	7.70 SQ HI = REAM WATER QUA	11 = 4928 QUALITY	4928 AC		USGS QUA	USGS QUAD- STERLING MASS LATITUDE 42-26-38 LONGITUDE 71-50-0 0-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 1343 CFS	NG HASS SIGN STORM	RM RL	LAT	TTUDE 8.1	LATITUDE 42-26-38 FF = 8.10 IN, PE/	-38 LI PEAK	LONGITUDE 71-50-03	DE 71-5 1343	0-03 CFS
0	0.0		19		9.1	* 65	653.0 E	2752 6.6	6 580	• •		218 *	659.7	4	132		*
100		15770	33	06914	13.0	* 62						106 *	645.3		94		0.42
397	1.0	4900	99	29460	19.1	+ 63	635.0 T	458 1-1	1 4240		649.4	157 *	653.3	3 37	120		1.09
1880	4.6	1130	152	13940	32.7	* 64	648.7 1					226 *	658.5		123		2.84
2177	5.3	1,030	167	13390	34.5		650.5 T	650.5 T 2238 5.5 1000 #	5 1000		657.0	242 *	657.0 242 * 660.0	44	134		3.07
RATING (1)	Q (1	NA-0607 DA= 4.70 SQ MI = 3008 AC SITE RATING (1) STREAM WATER QUALITY (A) 10	4.70 SQ MI REAM WATER	11 = 3008 AC	3008 AC ITY (A)		USGS QUAD- O-YR PRIN S	QUAD- STERLING MASS PRIN SPWY DESIGN STORM	STERLING MASS PWY DESIGN STO		LAT	ITUDE 8.1	LATITUDE 42-28-19 FF = 8.10 IN, PE	[LONGITUDE AK FLOW =		71-49-41 820 CFS
0	0.0		7		9.1	* 62	620.2 E	1496 6.0	0 1180	• •	622.2	142 *	625.7	7 52	251		:
717	2.9	2770	148	29510	38.7	29 +	625.2 E	2226 8.8	8 890		627.0	161 +	630.5	5 57	319		1.31
1	15.2	210	193	13870	4.09							237 *	642.9				3.24
5267	25.0	645.5 6267 25.0 490 255		12040	0.00	69	650.0 E	7510 30.0	014 0		6-159	294	654.8		829		3.91
COS	COSTS ARE EMERGENCY EMERGENCY	COSTS ARE BASED ON 1971 S.C.S. DESIGN EMERGENCY SPILLWAY STORAGE AND COSTS EMERGENCY SPILLWAY TYPE CODE— C=CONCR	N STO	971 S.C.S. DESIGN TORAGE AND COSTS A TPE CODE— C=CONCRE	S. DES	IGN CR IS ARE	DESIGN CRITERIA COSTS ARE BASED #CONCRETE CHUTE,	COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE. EMERGENCY SPILLWAY TYPE CODE— C.CONCRETE CHUTE, D.CONCRETE DROP.	DATA. STORAGE, ETE DROP,		INCLUDING BEN E=EXCAVATED,	BEN D,	BENEFICIAL POOL.	POOL.	IEFICIAL POOL.	NONE	
FEE	ELEVATIONS	ELEVATIONS ARE SHOWN TO THE NEAREST O.	TOWN	TO THE	NEAREST	0.1	FOOT T	I FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND	RIATION B	BETWEE	N DEV	ELOPRE	NTS O	NLY, A		ARE NOT TO	386

CREST STORAGE COST	COST COST	STORAGE COST	*********	BENEFICIAL PUUL	POOL	BENEFICIAL POOL		EMER	EMERGENCY SPILLWAY	1	* DESIGN	*	DAM		SAFE
COST COST	COST COST OF THE C	COST COST		******	*****	****	*****	******	********	*****	# # # # # # # # # # # # # # # # # # #	**********	*****	*****	* * TIELU
STORAGE PER AREA SURF AT 9 ELEV AT CREST PER 8 ELEV AREA ELEV HGT VOL. AL FT IN (15) (AF) (TY) (AF) (AF) (AF) (AF) (AF) (AF) (AF) (AF	ALCHING (2) STREAM WATER QUALITY (A) 100-YR PRIN SPW DESIGN STRAM NUMDFF = 8.10 IN, PEAK FLOW = 11.00 SQ MT = 7040 C USCS QUAD-STERLING MASS RATING (2) STREAM WATER QUALITY (A) 100-YR PRIN SPW DESIGN STORM NUMDFF = 8.10 IN, PEAK FLOW = 10.29	STORAGE PER AREA SURF AT SEELY AT CREST PER SELEV ARE SELEV ARE SURF AT STORAGE PER AREA SURF AT SURF				COST/	DEPTH .	CREST	STORAGE			•			
The color of the	Name	Mail Mail				SURF	DAM	ELEV + TYPE	AT CREST		• ELEV	AREA *		,	
O	Name Date 11.00 Sq H = 7040 AC USGS QUAD- STERLING HASS LATITUDE 42-27-31 LONGITUDE 42-27-31 LONGITUDE 43-11.00 Sq H = 7040 AC USGS QUAD- STERLING STEAM RUNDFF = 8.10 IN, PEAK FLOW STEAM STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM STREAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW STEAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM STREAM STREAM MATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM STREAM STR	Name Color	THSC) AC FT I	(\$) N	(AC)	(\$)	(FT)	(MSC)	AC FI	(\$) N	:		1		*
A	A	Data 11.00 Data 11.00 STRAM MATER QUALITY (A) 100-YR PRIN S PHY DESIGN STORM RASS LATITUDE 42-27-31 LONGITUDE 0 0.0	******	******	*****	****	*****	*		*******	******	*****	******		
0 0.0 0.0 19 55.7 185 565.2 61 556.2 10.5 5 57.5 E 3912 6.6 6.6 970 559.7 185 565.2 61 556.2 100 0.2 34.50 10.3 4154.0 36.5 5 540.5 T 1645 2.8 2610 5 555.0 158 559.0 55 435 133 133 133 135 100 0.2 34.50 10.3 4154.0 36.5 5 540.5 T 1645 2.8 2610 5 57.0 158 559.0 55 435 135 100 193 2570 10.3 4154.0 36.5 5 1140.8 24.0 480 6 571.4 250 577.5 5 602.9 100 1748	100 0.0 0.0	1557 2.7 2750 13 41540 36.5 576.	PATING	ŏ	1 - 00 SQ	-	040 AC			ING MASS	0.2110	ATITUDE	42-27-31		
0 0.0 0.0 19 10.5 5 57.5 E 3912 6.6 970 5 559.7 185 5 565.2 61 556 61 566 6470 0.2 34450 32 106620 14.7 5 518.8 1 188 0.3 18320 5 536.7 18 5 56.5 1 133 41540 136.5 5 56.5 1 1645 2.8 2610 5 575.0 158 5 559.0 5 5 435 435 435 435 435 435 435 435 435	0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	100 0.0 0.0 0.0 19 10.5 557.5 188 0.3 1832 0.6 539.7 185 536.7 33 133 135 1557 2.7 2.750 0.3 41540 36.5 5.46.5 1.68 5.56.0 5.55.0 1.88 5.55.0 5.5	200		1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4026	2	- 1		2010 10101		,			0041
100	100	190	0	0.	19		10.5	557.5	3912		. 559.7	185 *	565.2		
1557 2.7 2750 103 41540 36.5 * 540.5 T 1645 2.8 2610 * 555.0 158 * 559.0 55 435 4470 17.6 560 289 2080 81.0 * 595.5 E 13719 22.4 420 * 577.4 250 * 577.5 74 853 10890 23.7 7.6 560 289 20880 81.0 * 595.5 E 13719 22.4 420 * 577.4 372 * 602.4 98 1686 113980 23.7 7 490 346 19610 92.5 * 596.5 T 14068 24.0 480 * 601.4 372 * 603.9 100 1748	1557 2.7 2750 103 41540 36.5	1557 2.7 2750 103 41540 36.5 s 540.5 T 1645 2.8 2610 s 555.0 55 435 435 4470	100	5		106620	14.7	518.8		۲	533.0	•	536.7		*
4470 7.6 1100 193 25570 51.1 * 561.2 T 4558 7.8 1080 * 573.4 250 * 577.5 7 4 853 * 602.4 98 1686 * 11980 23.7 490 346 19610 92.5 * 596.5 T 14668 24.0 480 * 601.4 372 * 603.9 100 1748 * 11980 23.7 490 346 19610 92.5 * 596.5 T 14668 24.0 480 * 601.4 372 * 603.9 100 1748 * 11980 23.7 490 346 19610 92.5 * 596.5 T 14668 24.0 480 * 601.4 372 * 603.9 100 1748 * 11980 23.7 490 34.9 * 647.4 E 549 7.3 3360 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 57 4 813 * 641.4 27 * 643.2 3 3 64.4 69 61.0 * 641.4 61.4 61.4 61.4 61.4 61.4 61.4 61.	4470 7.6 1100 193 25570 57.1 561.2 7658 7.8 1080 573.4 250 577.5 74 859.5 139027 17.6 560 289 20080 81.0 595.5 13709 23.4 420 597.7 353 602.4 98 1686 139027 23.7 490 346 9610 92.5 595.5 14068 24.0 480 601.4 372 603.9 100 1748 139027 23.7 490 346 9610 92.5 595.5 14068 24.0 480 601.4 372 603.9 100 1748 100 1.2 15760 15 102910 19.7 632.3 1580 641.4 27 643.2 33 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 33 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 33 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 33 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 33 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 34 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 34 57 100 1.2 15760 15 102910 19.7 632.3 158 2.0 9950 641.4 27 643.2 34 57 1867 25.0 1610 71 424.0 673.5 188 2.2 1560 653.0 641.5 675.9 67 641.5 1867 25.0 1610 71 424.0 673.5 188 2.2 1560 673.8 74 675.9 1867 25.0 1610 71 424.0 673.5 675.0 677.8 74 74 675.9 67 1867 25.0 1610 71 424.0 673.5 675.0 677.8 78 672.4 67 67 1867 25.0 1610 71 424.0 673.5 675.0 677.8 78 672.4 67 67 67 1868 25.0 1610 71 424.0 677.8 67	4470 7.6 1100 193 25770 57.1 * 561.2 7 4558 7.8 1080 * 573.4 250 * 577.5 74 853 7100 17.6 1100 193 25770 81.0 * 595.5 E 13719 23.4 420 * 597.7 5 603.9 100 1748 81380 23.7 490 346 19610 92.5 * 596.5 E 13716 23.0 * 601.4 372 * 603.9 100 1748 81380 23.7 490 346 19610 92.5 * 596.5 E 13716 420 * 597.7 \$ 603.4 372 * 603.9 100 1748 81100 1.2 15760 15 102910 19.7 * 632.3 E 158 2.0 9950 * 644.7 27 * 643.2 33 57 491	1557			41540	36.5 *	540.5			. 555.0		559.0		*
13980 23.7 17.6 560 289 20080 81.0 595.5 1 1408 24.0 480 601.4 372 603.9 100 1748	10297 17.6 560 289 20880 81.0 595.5 13119 23.4 420 597.7 353 602.4 98 1686 13980 23.7 490 346 19610 92.5 596.5 14068 24.0 480 601.4 372 603.9 100 1748 13880 23.7 490 346 100-YR PRIN SPW DESIGN STORM RUNDFF 8.10 IN, PEAK FLOW 100 1.2 15760 15 102910 19.7 632.5 1310 4.1 5180 641.4 27 643.2 33 57 100 1.2 15760 15 102910 19.7 632.5 130 4.1 5180 643.7 20 658.0 20 20 1690 22.6 1740 67 43860 61.0 673.5 1870 675.4 74 675.9 675.9 675.9 1690 22.6 1740 67 43860 61.0 673.5 1470 673.0 673.0 673.0 673.0 1690 22.6 1740 67 43860 61.0 673.5 1470 677.4 675.9 675.9 1690 22.6 1740 67 43860 61.0 673.5 1470 677.4 675.9 675.9 1690 22.6 1740 67 43860 61.0 673.5 1470 677.4 677.8 677.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.5 1470 677.8 78 675.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.4 74 677.8 675.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.4 74 677.8 675.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.4 74 675.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.4 74 675.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.4 74 676.9 675.9 1867 25.0 1610 71 42440 63.5 676.0 675.4 74 676.9 675.9 1867 25.0 1670 93 16940 53.0 597.5 170 80.0 599.5 105 601.2 591.2 83 70.0 1480 15.3 1070 93 16940 53.0 597.5 170 80.0 607.9 127 609.7 68 370 2400 25.0 790 116 16250 61.6 606.2 62702 28.0 700 607.9 127 609.7 68 370 1880 15.3 1070 93 16940 60.0 60.0 60.0 70.0 60.0 60.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.0 70.	10.297 17.6 560 289 20080 81.0 595.5 E 13719 23.4 420 597.7 353 602.4 98 1686 13980 23.7 490 346 19610 92.5 5 596.5 1468 24.0 480 601.4 372 603.9 100 1748 13980 23.7 490 346 19610 92.5 1468 24.0 480 601.4 372 603.9 100 1748 13880 23.7 400 3 28800 34.9 647.4 6 52.8 2.0 9950 643.7 20 643.2 33 57 150	0144			25570	57.1	561.2			573.4		577.5		*
13980 23-7	13980 23.7 490 346 19610 92.5 596.5 14668 24.0 480 601.4 372 603.9 100 1748	13980 23.7 490 346 19610 92.5 596.5 14068 24.0 480 601.4 372 603.9 100 1748	10297			20080	81.0 *	595.5			1.765 #				*
DA= 1.40 Sq MI = 1996 AC	RATING (2) STREAM WATER QUALITY (A) 100-YR PRIN SPW DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW	Date Date	13980			19610	92.5	596.5	T 14068 24	:	* 601.4	372 *			•
STREAM WATER QUALITY (A) 100-YR PRIN SPHY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 100 I.2 1576 15 102910 19.7 * 632.3 * 6 15 8 2.0 9950 * 634.7 20 * 635.0 26 29 45 45 45 3 6.1 2230 46 47460 48.5 * 661.0 * 6115 14.8 3360 * 649.8 37 * 651.2 41 110 48.7 22.6 1740 67 43860 61.0 * 673.5 * 6 1760 * 675.4 74 * 676.9 675.4 74 * 676.9 675.4 74 * 676.9 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 * 6 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 * 6 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 * 625.0 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 * 6 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 * 625.0 1470 * 677.8 78 * 679.4 69 538 1867 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0 28.0 27.0	STREAM WATER QUALITY (A) 100-YR PRIN SPHY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 100 1	RATING (2) STREAM WATER QUALITY (A) 100-YR PRIN SPUY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 0.00 0.00 3 3 7.8 6.39.5 E 310 4.1 5180 6.41.4 27 6.43.2 33 57 67 6 20 20 20 20 20 20 20 20 20 20 20 20 20			******	*****	########	1000	*********	. 2	*****	=	********	*****	
0 0.0 3 7.8 6.39.5 5 10 6.11.4 27 6.43.2 33 57 57 6.43.2 39 57 6.43.2 39 57 6.43.2 39 57 6.43.2 39 57 6.43.2 41 110 6.53.0 6.43.2 6.	0 0.0 0 3 7.8 * 639.5 E 310 4.1 5180 * 641.4 27 * 643.2 33 57 6 596.0 26 29 453 0 1.2 15760 15 102910 19.7 * 632.5 E 158 2.0 998.0 * 649.8 37 * 651.2 41 110 110 110 110 110 110 110 110 110	0 0.0 0 3 7.8 # 639.5 E 310 4.1 5180 # 641.4 27 # 643.2 33 577 6 636.0 26 29 453 6.1 4070 32 58300 34.9 # 647.4 E 549 7.3 3360 # 649.8 37 # 651.2 41 110 983 13.2 2230 46 47460 48.5 # 661.0 E 1115 14.8 1970 # 663.0 53 # 664.5 55 258 1690 22.6 1740 67 43860 61.0 # 673.5 E 1878 25.2 1560 # 677.4 # 676.9 67 484 1867 25.0 1610 71 42440 63.5 # 676.0 E 2055 27.5 1470 # 677.8 78 # 679.4 69 538	RATING	5	EAM WATE	17	TY (A)		RIN SPWY	ESIGN STOR	RUND	= 8.1	O IN, PE	AK FLOW =	
100 1.2 15760 15 102910 19.7 * 632.3 E 158 2.0 9950 * 649.8 37 * 651.2 41 110 453 6.1 4070 32 58300 34.9 * 647.4 E 549 7.3 3360 * 649.8 37 * 651.2 41 110 453 6.1 4070 32 58300 34.9 * 647.4 E 549 7.3 3360 * 649.8 37 * 651.2 41 110 41 4070 32 58300 34.9 * 647.4 E 549 7.3 3360 * 649.8 37 * 651.2 41 110 41 41 41 41 41 4	100 1.2 15760 15 102910 19.7 * 632.3 E 158 2.0 9950 * 634.7 20 * 636.0 26 29 453 6.1 4070 32 58300 34.9 * 647.4 E 54.9 7.3 3360 * 649.8 37 * 651.2 41 110 453 6.1 4070 32 58300 34.9 * 647.4 E 54.9 7.3 3360 * 649.8 37 * 651.2 41 110 4240 62.0 67.0 67.3 664.5 55 258 649.8 110 67.3 649.8 37 * 651.2 41 110 67 484 674.4 67 484 676.9 67 67.3 67	100 1.2 15760 15 102910 19.7	0	0	En en		7.8	639.5	310	:	641.4	27 *	643.2		
453 6.1 4070 32 58300 34.9 * 647.4 E 549 7.3 3360 * 649.8 37 * 651.2 41 110 1983 13.2 2230 46 47460 48.5 * 661.0 E 1115 14.8 1970 * 663.0 53 * 664.5 55 258 1690 22.6 1740 67 43860 61.0 * 673.5 E 1878 25.2 1560 * 675.4 74 * 676.9 67 484 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 ***********************************	453 6.1 4070 32 58300 34.9 * 647.4 E 549 7.3 3360 * 649.8 37 * 651.2 41 110 140	453 6.1 4070 32 58300 34.9 + 647.4 E 549 7.3 3360 + 649.8 37 + 651.2 41 110 983 13.2 2230 46 47460 48.5 + 661.0 E 1115 14.8 1970 + 663.0 53 + 664.5 55 258 1690 22.6 1740 67 43860 61.0 + 673.5 E 1878 25.2 1560 + 675.4 74 + 676.9 67 484 1867 25.0 1610 71 42440 63.5 + 676.0 E 2055 27.5 1470 + 677.4 78 + 676.9 67 484 1867 25.0 1610 71 42440 63.5 + 676.0 E 2055 27.5 1470 + 677.4 78 + 676.9 67 484 1867 25.0 1610 71 42440 63.5 + 676.0 E 2055 27.5 1470 + 677.4 18 + 679.4 69 538 1884 1885 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1887 1880 1888 1880 1888 1880 1888 1880 1	100			102910	19.7	632.3	158	1	* 634.7	20 *	636.0		*
983 13.2 2230 46 47460 48.5 * 661.0 E 1115 14.8 1970 * 663.0 53 * 664.5 55 258 1690 22.6 1740 67 43860 61.0 * 673.5 E 1878 25.2 1560 * 675.4 74 * 676.9 67 484 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1070 93 16940 53.8 * 577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 80 790 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370	983 13.2 2230 46 47460 48.5 * 661.0 E 1115 14.8 1970 * 663.0 53 * 664.5 55 258 1690 22.6 1740 67 43860 61.0 * 673.5 E 1878 25.2 1560 * 675.4 74 * 676.9 67 484 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 16940 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 16940 53.0 * 577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 129 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 700 * 607.9 127 * 609.7 68 370 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 18 18 18 18 18 18 18 18 18 18 18 18 18	983 13.2 2230 46 47460 48.5 = 661.0 E 1115 14.8 1970 = 663.0 53 = 664.5 55 258 1690 22.6 1740 67 43860 61.0 = 673.5 E 1878 25.2 1560 = 675.4 74 = 676.9 67 484 1867 25.0 1610 71 42440 63.5 = 676.0 E 2055 27.5 1470 = 677.8 78 = 679.4 69 538 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	453			58300	34.9 *	647.4	549		* 649.8	37 *	651.2		
1690 22.6 1740 67 43860 61.0 * 673.5 E 1878 25.2 1560 * 675.4 74 * 676.9 67 484 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1690 22.6 1740 67 43860 61.0 * 673.5 E 1878 25.2 1560 * 675.4 74 * 676.9 67 484 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 ***********************************	1690 22.6 1740 67 43860 61.0 * 673.5 E 1878 25.2 1560 * 675.4 74 * 676.9 67 484 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538 1170	983			47460	48.5 *	661.0	11115		. 663.0	53 +	664.5		
1867 25.0 1610 71 42440 63.5 % 676.0 E 2055 27.5 1470 % 677.8 78 % 679.4 69 538 % 688 % 688 % 688 % 688 % 678 % 688 % 678 % 688 % 678 % 678 % 678 % 678 % 678 % 678 % 678 % 678 % 678 % 678 % 688 % 678 % 68	1867 25.0 1610 71 42440 63.5 % 676.0 E 2055 27.5 470 % 677.8 78 % 679.4 69 538	1867 25.0 1610 71 42440 63.5 * 676.0 E 2055 27.5 1470 * 677.8 78 * 679.4 69 538	1690			43860	61.0 #	673.5	1878		* 675.4	4 42	6.919		
DATE 1.80 SQ MI = 1152 AC USGS QUAD— STERLING MASS LATITUDE 42-27-16 LONGITUDE O 0.0 O 0.0 A 7.8 * 577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 TO 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370	DA= 1.80 SQ MI = 1152 AC USGS QUAD— STERLING MASS LATITUDE 42-27-16 LONGITUDE RATING (1) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 0 0.0 4 7.8 577.5 E 398 4.1 2380 579.7 35 581.7 40 57 330 3.4 3450 29 39890 33.8 582.3 E 592 6.1 1920 584.7 56 586.5 45 80 790 8.2 1670 64 20580 44.5 589.0 E 981 10.2 1350 591.2 83 592.9 51 129 1480 15.3 1070 93 16940 53.0 597.5 E 1730 18.0 910 599.5 105 601.2 59 227 2400 25.0 790 116 16250 61.6 606.2 E 2702 28.0 700 607.9 127 609.7 68 370	ATING (1) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 1.80 SQ MI = 1152 AC USGS QUAD- STERLING MASS ATING (1) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 1.80 SQ MI = 1152 AC USGS QUAD- STERLING MASS AND OLOO 0.0 0.0 4 7.8 * 577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 790 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 ***********************************	673.5 1867 25	.0 161	11 0	45440	63.5 #	676.0			* 677.8	18 *	679.4		*
RATING (1) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 0 0.0 4 7.8 * 577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 80 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370	RATING (1) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 1.00	RATING (1) STREAM WATER QUALITY (A) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 6.00.0	*****	*****	*****	*****	*****		*****	中央中央中央中央中央上	******	-		*	-
577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 * * * * 582.3 E 592 6.1 1920 * 584.7 56 * 586.5 45 80 * 0. 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 * 0. 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 * 1. 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * 1.	9 0 0.0 4 7.8 * 577.5 E 398 4.1 2380 * 579.7 35 * 581.7 40 57 * *** 3 30 3.4 3450 29 39890 33.8 * 582.3 E 592 6.1 1920 * 584.7 56 * 586.5 45 80 * 0. 5 790 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 * 0. 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 * 1. 7 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * 1.	330 3.4 3450 29 39890 33.8 4 577.5 E 398 4.1 2380 4 579.7 35 4 586.5 45 80 8 0.8 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2	PATING	A C	LOCO OCO	-	152 AL	100-VB	DAD- SIEK	ING MASS	CNII	11100E		•	
582.3 E 592 6.1 1920 * 579.7 56 * 586.5 45 80 * 689.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68	0 0.0 4 7.8 577.5 6 330 4.1 2380 579.7 35 581.7 40 57 ** 3 330 3.4 3450 29 39890 33.8 582.3 6 592 6.1 1920 584.7 56 586.5 45 80 7 790 8.2 1670 64 20580 44.5 589.0 981 10.2 1350 591.2 83 592.9 51 129 1480 15.3 1070 93 16940 53.0 597.5 1730 18.0 910 599.5 105 601.2 59 227 4 7 2400 25.0 790 116 16250 61.6 606.2 2702 28.0 700 607.9 127 609.7 6	0 0.0 4 7.8 + 577.5 E 398 4.1 2380 + 579.7 35 + 581.7 40 57 + 1 2380 + 579.7 35 + 581.7 40 57 + 1 2380 + 579.7 35 + 584.7 56 + 586.5 45 80 + 1 2380 33.4 3450 29 39890 33.8 + 582.3 E 592 6.1 1920 + 584.7 56 + 586.5 45 80 + 1 29 + 1 29 8 8.2 1670 64 20580 44.5 + 589.0 E 981 10.2 1350 + 591.2 83 + 592.9 51 129 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 68 370 + 1 2400 25.0 700 + 607.9 127 + 609.7 7 68 370 + 1 2400 20.0 700 + 607.9 127 + 609.7 7 68 370 + 1 2400 20.0 700 + 607.9 127 + 609.7 7 68 370 + 1 2400 20.0 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7					•		-						
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597.5 E 1730 18.0 910 + 599.5 105 + 601.2 59 227 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 +	5 790 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 * 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 * 12400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * * * * * * * * * * * * * * * * * * *	790 8.2 1670 64 20580 44.5 * 589.0 E 981 10.2 1350 * 591.2 83 * 592.9 51 129 * 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 * 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * * * * * * * * * * * * * * * * * * *	330			39890	33.8 #	582.3	592		. 584.7	* 95	586.5		
597.5 E 1730 18.0 910 + 599.5 105 + 601.2 59 227 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 +	7 1480 15.3 1070 93 16940 53.0 * 597.5 E 1730 18.0 910 * 599.5 105 * 601.2 59 227 * 7400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * * * * * * * * * * * * * * * * * * *	7 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * **********************************	190			20580	44.5 *	589.0	981		. 591.2	83 *	592.9		*
606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 +	7 2400 25.0 790 116 16250 61.6 + 606.2 E 2702 28.0 700 + 607.9 127 + 609.7 68 370 +	7 2400 25.0 790 116 16250 61.6 * 606.2 E 2702 28.0 700 * 607.9 127 * 609.7 68 370 * * * * * * * * * * * * * * * * * * *	1480			16940	53.0 *	597.5	1730		599.5	105 *	601.2		*
		**************************************	2400			16250	61.6 *	606.2	2702		6.709	127 *	2.609	:	
							•					*			•

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(4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.

(5) ELEVATIONS ARE SHOWN TO THE NEAREST O.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO BE CONSIDERED ACCURATE TO THAT DEGREE.

(6) CONSIDERED ACCURATE TO THAT DEGREE.

(6) TABULAR PROPERTIENT OF THAT DEGREE.

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

**************************************	BENET TOTAL TOOL		BENEFICIAL POOL *			EMERGENCY	SPILLWAY		* DESIGN			DAM		SAFE
	********	*	**************************************	*******	*******		**************************************	**************************************	A TICH TO THE TERM OF THE TERM		******	* * * * * * * * * * * * * * * * * * * *	*****	* AT 95
	-	AREA	SURF	1	, ш	AT C	AT CREST	PER *	ELEV	AREA *	i	HGT		*CHANCE
(MSL) AC FT IN (\$) (AC) (\$) (FT) + ((\$)	(AC)	(\$)	(FT)		AC FT	ZI	* (\$)	(MSF)	(AC) *	(MSL)	FT	* (\(\)	(MGD)
NA-0616 D SITE RATING (1)	DA= 1.80 STREAM W	O SO MI	= 1.80 SQ MI = 1152 AC STREAM WATER QUALITY (A)	1152 AC ITY (A)		QUAD- S	QUAD- STERLING MASS PRIN SPWY DESIGN ST	QUAD- STERLING MASS PRIN SPWY DESIGN STORM	RUND	ATITUDE	LATITUDE 42-25-34 LONGINEFF = 8.10 IN. PEAK FLOW	34 LON	LONGITUDE K FLOW =	71-46-32 543 CFS
460.5 0 0.0		2			* 482.2	2 E 398	8 4.1	1970		37	486.5	30	* 79	*
100	8790	15	57180		* 483.0	w ı		2080 *	485.4	39 *		31	72 *	0.27
•	2060	59	31880	38.0	496.5	. .		1750 *	498.9	73 *	500.5	45	189 *	1.00
1961 1361 6906	0661	70	07797	40.0		U E 1/48	18.2	1550	0./00	* *	5.08.9	55	* 667	1.25
	DA= 1.0	1.00 SQ MI	= 1	640 AC		QUAD	QUAD- STERLING MASS	MASS	•	T I TUDE	LATITUDE 42-23-40 LONGITUDE	to LON	* !	71-46-02
SILE KALING (2)	SIKEAM WAIEK	WAICK	GOALIIY	A C	* 442 E	X M	WY DEST	SPWT DESIGN SIUKM	KUNUFF	# 7°	BEID IN PEAR FLUM	SEAK FL	11 6	302 CFS
100	9440	21	45640			u u		5610 *	443.7	}	444.9	17	22 *	0.21
454.4 717 13.3	3100	57	25340	26.4	* 449°7 * 456°9		3 16.4	2300 *	458.4	53 *	452.5	32	45 *	0.45
1087	1320	89	21230	32.4	* 462.9	E 1	- 1	1120 *	464.0	82 *	465.5	37	109 *	0.78
462.5 1238 23.2 1220 76 19860 34.5 # ************************************	1220	76	19860	34.5		0 E 1449	9 27.2	1040 *	465.0 E 1449 27.2 1040 # 466.2 90 # 467.5	* 06	467.5	39	39 122 *	0.81
NA-0618 SITE RATING (2)	DA= 0.9	0.90 SQ MI SEAM WATER	= 0.90 SQ MI = 576 STREAM WATER QUALITY	576 AC TY (A)		QUAD- H	ORCESTE WY DESI	QUAD- WORCESTER NORTH MASS PRIN SPWY DESIGN STORM RUN	MASS LA	LATITUDE	DE 42-22-17		TUDE =	71-47-58 272 CFS
2 0 0 2		,		7 7				* 0300		1		70	* :	
100	6440	14	46200	16.6	* 513.0	u	4 3.0	4480 *	515.4	15 *	516.8	23	34 *	0.21
320	2670	21	40620	30.0	526.5	w c	- 1	2220	528.8	26 *	530.0	36	93 *	0.41
548.5 1090 22.7	1270	2¢ 41	33790	54.5	* 551.0	3.E 137	2 25.0	1150 *	552.7	50 *	554.2	\$ \$	326 *	0.29
	1210	43	33680	57.0	* 553°5	5 E 1317	7 27.4	1100 *	555.3	* 14	556.8	63	363 *	0.75
NOTES - (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE. INCLINING RENFERENCE POOL	BASED ON	ON 1971	1971 S.C.S. STORAGE AND	S. DESIGN	GN CRITERIA	RIA AND	AND COST DATA. ON TOTAL STORAGE.	DATA.	TOO TOTAL STREET	S BENE	FTCTAL	inuc		*
1	SPILLWAY TYPE	AY TYP BASED	E CODE-	C=CONCRE	שו	TE CHUTE, D=	CONCRETE		EEEXCAVATED, T= TWO SPILLWAYS, N= NON ARE PRIMARILY FOR COMPARISON PURPOSES	ARILY	FOR COM	PILLWAY	S, N= NC	NONE SES.
(5) ELEVATIONS ARE SHOWN TO THE	VS ARE S	HOWN I	ARE SHOWN TO THE P	NEAREST 0.		N OT TO	OW VARI	ATION BE	1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY,	SVELOPM	ENTS ON	Y. AND	ARE NO	NOT TO BE

ELEV STORAGE CCSS COST DEPTH CREST STORAGE COST NUMBER CLOSE TO THE MATCH CONTROL OF THE MATCH CONTROL OF THE MATCH CASES STORAGE CCSS TORAGE CCSS TO THE MATCH COST OF THE MATCH CASES STORAGE CCSS TORAGE CCSS T			BENEFICIAL FUUL				e s	EMERGENCY		SPILLMAY	* 1	DESIGN			DAM		* SAFE
Color Colo	2	****	******	****	*****	*****	1 1	*****	*****		****	******	*****	******	*****	*****	* AT 95
FI IN (15) (AC) (15) (FI) (15) (HSL) AC FI IN (15) (HSL) (AC) (HSL) (FI (1000 c) (HSL) (AC) (AC) (AC) (AC) (AC) (AC) (AC) (AC	OR		COST		C0ST/	DEPTH					0ST *			TOP		FILL	
1981 AC FT IN		AGE	H	AREA	SURF		* ELE				ER *	ELEV			HGT	VOL	*CHANCE
Data Loo Sq HI = 640 AC USGS QUAD—CLINTON MASS LATITUDE 42-25-08 LONGITUDE 71-10 Data Latitude 42-25-08 LONGITUDE 71-10 Data Latitude 42-25-08 LONGITUDE 71-10 Data Data Latitude 42-25-08 LONGITUDE 71-10 Data	FT	Z	(\$)	(AC)	(\$)	(FT)	(M S	() A	C FT	Z I	* (\$)	(MSL)	(AC)	(MSL)	FT	CY)	* (MGD)
0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0.0	-0620 SITE RATING	(3)	A= 1.0	D SQ WATE	MI = V	640 AC	100	GS QUA	D- CLIA	TON MA	STORM	RUNOF	AT (TUDE F = 8	42-25	-08 LC PEAK F	NGITUDE LOW =	71-42-54 302 CES
19, 17570 13 132800 15.5 348.0 149 2.7 12250 350.5 17 351.9 22 21 8 0 0 1.9 17570 28 68180 26.7 359.2 2 399.7 2 4810 351.6 57 372.9 43 99 59 8 0 0 12.0 3300 64 36250 42.5 375.0 1188 22.2 2 1960 377.2 82 379.9 50 141 8 0 12.0 2300 64 36250 42.5 375.0 1188 22.2 2 1960 377.2 82 379.9 50 141 8 1 1 1 1 1 1 1 1	C	0-0		7		0 6			221	4-1	* 8020	354.7				35	* *
116 5.9 6050 28 69180 26.7 * 359.2 E 398 7.5 4810 * 361.6 37 * 363.2 33 55 * 0 6 6 6 6830 55.7 * 368.2 E 769 14.3 2770 * 370.6 57 * 372.9 43 99 * 0 6 6 6830 55.7 * 368.2 E 769 14.3 2770 * 370.6 57 * 372.9 43 99 * 0 6 6 6 6830 55.7 * 368.2 E 769 14.3 2770 * 370.6 57 * 372.9 43 99 * 0 6 6 6 6830 65.7 * 368.2 E 769 14.3 2770 * 377.2 * 22 * 379.9 * 375.0 E 1188 22.2 1960 * 377.2 * 22 * 379.9 * 379.9 * 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	100	1.9	17570		132800	15.5			143		1	350.5	1			23	1
10.0 12.0 2300 46 46830 35.7 8 368.2 769 14.3 2770 8 370.6 57 8 372.9 43 99 8 0	316	5.9	6050		69180	26.7	* 35				4810 *	361.6		363		55	* 0.42
19.0 C 1100 22.2 1900 # 517.6 82 # 519.9 50 141 # 18.8 # # # # # # # # # # # # # # # # # #	640	1.2.0	3330	46	46830	35.7	# 36		,	1	2770 *	370.6	57			66	
Date Date	040	73.0	0063	5	30530	74-7	n. + +			7.7	*	20116	1		Ì		
JSGS QUAD— CLINTON MASS LATITUDE 42-24-52 LONGITUDE ***********************************	****	*****	******	****	*****	******	*****	*****	*****	******	*****	******	*****	*****	******	******	李 南 幸 印 幸 卒 辛 亦 幸
## ## ### ### ########################	SNI		STRFAM	O SQ	4 I = 2	176 AC	100		D- CLIA	NTON MA	ISS	ONITA	TITU	42-24	-52 LC	ONGITUDE	71-42-32
40.4 E 855 4.6 1480 * 342.7 94 * 345.1 25 41.8 42 * 340.5 E 869 4.8 1460 * 342.9 95 * 345.2 25 42 * 348.1 E 1635 9.0 910 * 350.5 127 * 352.7 33 72 * 357.2 E 2905 16.0 620 * 359.5 172 * 369.1 49 175 * 357.2 E 2905 16.0 620 * 367.1 240 * 369.1 49 175 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * 369.1 49 175 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * 369.1 49 175 * 369.1 49 175 * 369.1 49 175 * 369.1 49 175 * 369.1 49 175 * 374.7 E 157 4.9 2540 * 474.7 22 * 476.2 14 8 * 374.7 E 157 4.9 2540 * 476.2 24 * 477.5 15 10 * 374.7 E 157 4.9 2540 * 479.7 27 * 460.9 19 16 * 369.1 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.2 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 364.7 E 460.7							*	1			*						*
1460.5 E 869 4.8 1460 * 342.9 95 * 345.2 25 42 * 348.1 E 1635 9.0 910 * 350.5 127 * 352.7 33 72 * 348.1 E 1635 9.0 620 * 359.5 172 * 361.7 42 121 * 357.2 E 2905 16.0 620 * 357.1 240 * 369.1 49 175 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * 365.0 E 4349 24.0 500 * 367.1 240 * 369.1 49 175 * 366.0 E 4349 24.0 500 * 367.1 240 * 369.1 49 175 * 366.0 E 470.2 24 * 470.2 24 * 470.2 24 * 470.2 24 * 470.2 24 * 470.2 24 * 470.2 24 * 470.2 25 * 30 * 30 * 30 * 30 * 30 * 30 * 30 * 3	0	0.0		32		8.0	9	i	855	4.6	- 1	342.7	- 1			41	****
148.1 E 1635 9.0 910 * 350.5 127 * 352.7 33 72 * 357.2 E 2905 16.0 620 * 359.5 172 * 361.7 42 121 * 365.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * * * * * * * * * * * * * * * * * * *	103	9.0	12330	32	39440	8.0			698	4.8		342.9				45	* 0.33
157.2 E 2905 16.0 620 * 359.5 172 * 361.7 42 121 * 165.0 E 4343 24.0 500 * 367.1 240 * 369.1 49 175 * * * * * * * * * * * * * * * * * * *	943	5.1	1580	89	16640	21.6	6		- 1	0.6	1	350.5		352		72	* 1.34
######################################	2208	12.2	810	138	12940	32.8	ניז			0.9		359.5	172			121	2
15GS QUAD- STERLING MASS LATITUDE 42-24-45 LONGITUDE D-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOH = 8.70 1793	20.9	580	197	11060	42.5	(1)	- 1		0.4.0		367.1		369.		175	* 2.67	
JSGS QUAD- STERLING MASS LATITUDE 42-24-45 LONGITUDE -YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = **********************************	****	*****	*******	****	*****	*****		******	*****	*****	******	******	******	*****	*****	******	****
**************************************	ING		JA= 0:6 STREAM	MATE	ALI	384 AC TY (A)	100-		D- STER	DESIGN	ASS STORM	RUNO	ATITUDE F = 8.	42-24 10 IN	PEAK F	NGITUDE	-
73.5 E 133 4.1 2810 * 474.7 22 * 476.2 14 8 * * * 74.7 E 157 4.9 2540 * 476.2 24 * 477.5 15 10 * 78.2 E 241 7.5 1800 * 479.7 27 % 460.9 19 16 * 16 * 78.2 E 241 7.5 1800 * 479.7 27 % 460.9 19 16 * 16 * 781.2 E 330 10.3 1440 * 482.5 38 * 483.7 22 22 * 784.7 E 466.14.6 1220 * 486.0 51 * 487.0 25 30 * 785.0 E 477 14.8 1220 * 486.0 51 * 487.2 25 31 * 7817ERIA AND COST DATA. ***********************************							*	1			*						*
10 5.0 5980 20 20250 10.2 # 4/4.7 E 15/ 4.9 2540 # 4/6.2 24 # 4/7.5 10 # 10 # 15/ 5.5 2480 23 18610 13.7 # 478.2 E 241 7.5 1800 # 479.7 27 # 460.9 19 16 # 249 7.8 1910 26 18080 16.7 # 481.2 E 330 10.3 1440 # 482.5 38 # 483.7 22 22 # 25 11.3 1580 36 15610 20.2 # 484.7 E 466.14.6 1220 # 485.9 51 # 487.0 25 30 # 25 11.5 1570 37 15530 20.5 # 485.0 E 477 14.8 1220 # 486.0 51 # 487.2 25 31 # 24 **********************************	0	0.0		6	4	2.3	*		133	4.1		474.7				8	*
181.2 E 330 10.3 1640 # 482.5 38 # 483.7 22 22 # 181.2 E 330 10.3 1640 # 482.5 38 # 483.7 22 22 # 184.7 E 466.14.6 1220 # 485.9 51 # 487.0 25 30 # 185.0 E 477 14.8 1220 # 486.0 51 # 487.2 25 31 # 185.0 E 477 14.8 1220 # 486.0 51 # 487.2 25 31 # 185.0 E 477 14.8 1220 # 486.0 51 # 487.2 25 31 # 185.0 E 477.2 25 31 # 185.0 E 477.2 25 31 # 185.0 E EXCAVATED	100	ر ا ا	3980	20	20250	10.2	*		157	4.9		7.014				01	
184.7 E 466.14.6 1220 * 485.9 51 * 487.0 25 30 * 185.0 E 477 14.8 1220 * 486.0 51 * 487.2 25 30 * 185.0 E 477 14.8 1220 * 486.0 51 * 487.2 25 31 * 185.0 E 477 14.8 1220 * 186.0 51 * 487.2 25 31 * 185.0 E 47.1 14.8 1220 * 186.0 51 *	240	7.0	1910	24	18080	16.7		- 1	330 1	000	-1	41905	30		-	22	0 30
*85.0 E 477 14.8 1220 * 486.0 51 * 487.2 25 31 * *********************************	361	11.3	1580	36	15610	20.2			466.1	4.6		485.9		487		30	0.36
RE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. FE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NON FOR CHUTE, D=CONCRETE ORDER OF SPINANTIAL SOLUTION PROPERTY.	369	11.5	1570	37	15530	20.5		15.0 E	477	4.8	1220 *	486.0		487		31	:
EMERGENCY SPILLWAY STURAGE AND CUSIS ARE BASED UN TUTAL STURAGE, INCLUDING BENEFICIAL FOUL. EMERGENCY SPILLWAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= TARHIAD DATA ARE BASED ON OBELIMINARY INCORMATION ETCHES CHOMM ARE RETAINED.	1) CO	STS ARI	BASED	01 NC	71 S.C.	S. DESI		ITERIA	AND CC	IST DAT	A.				000		
EMENGENCY STILLE THE CODE CACONOMICS PARTIES ON OF THE TOWN AS TO STILL BY STILL BY STALLMARS. N-	- !	FREENC	SPILLW	AY 51	OKAGE AL	SOO ON		BASED	ON NO	AL SIC		INCLUDI	NG BENE	TICIAL	PUDI.	1	NOW C
THE RESERVE THE PROPERTY OF TH		BULAR 1	ATA ARE	BASE	ON PRI	TIMINA		FORMAT	ION. FI	GURES		ARE PRI	MARILY	FOR CO	MPARISO	PURPO	SES.
.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND		EVATION	IS ARE S	NMOT	TO THE	VEAREST		FOOT T	MOHS O	VARIAT	TON RE	TUREN	EVEL OPM	IENTO O	3	AP. ARF N	OT TO RE

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

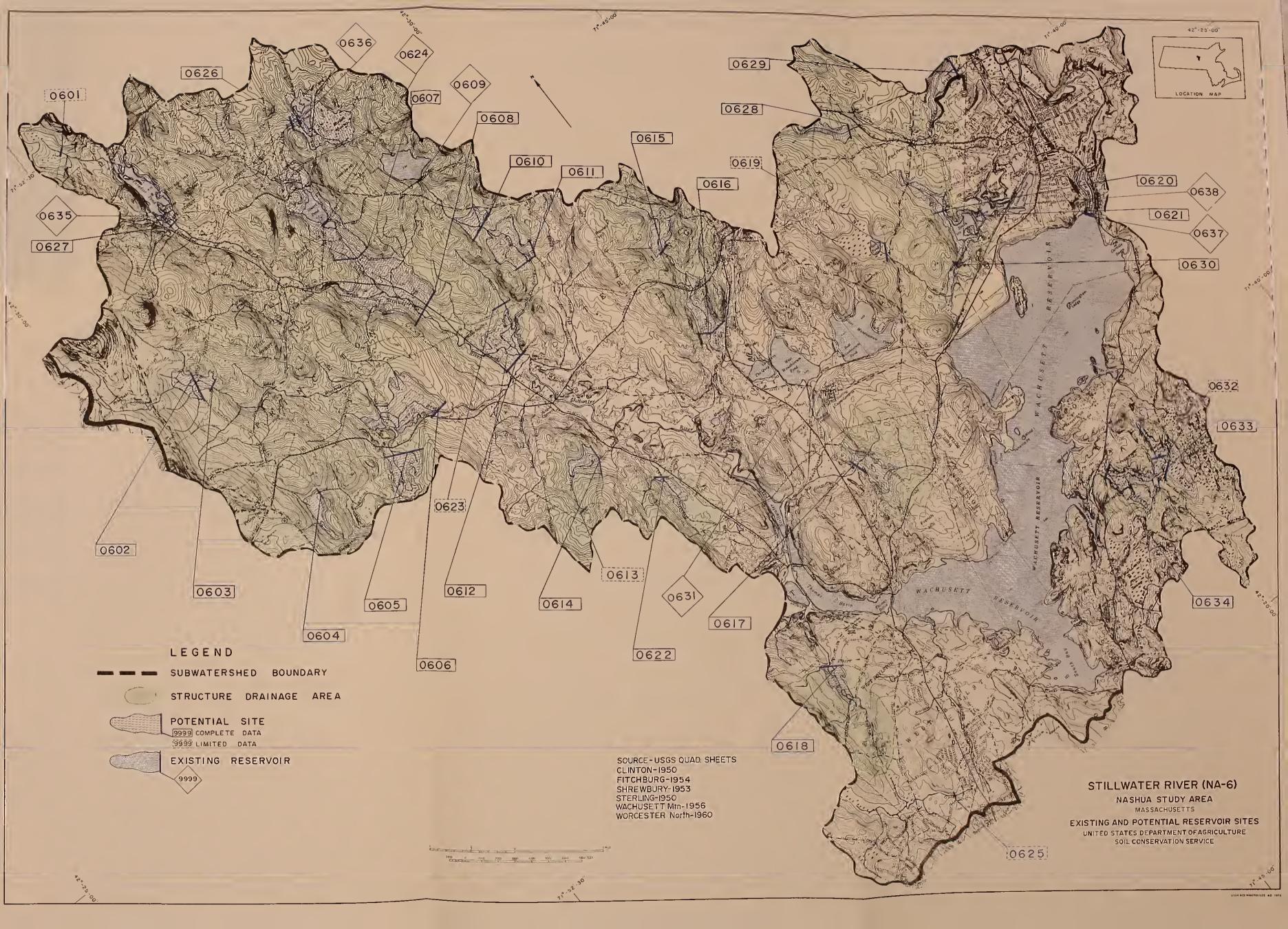
		BENEFI	BENEFICIAL POOL	75		*	EMER	GENCY	ERGENCY SPILLWAY	BENEFICIAL POOL * EMERGENCY SPILLWAY * DESIGN * DAM	* DE	DES I GN	*	DAM	T		* SAFE
						*					* HIGH	HIGH WATER	1				YIELD
			COST		2002 - CREST - CREST - CREST - CREST - CREST - CREST - CREST - CREST	DEPTH *	CREST	STO	STORAGE	专事专事者等专事专事专事专事专事专事专事专事专事专事专事专事的专事 STORAGE COST 本		*	•	TOP	* * * * * * *	******	* AT 95 *PFRCENT
ELEV	STORAGE	AGE	PER AC FT	AREA			• ELEV	AT	AT CREST	PER AC FT	* ELEV	V AREA	* *	>	HGT VC		*CHANCE
(MSL)	AC FT	Z	(MSL) AC FT IN (\$) (AC) (\$)	(AC)	(\$)			AC FT	Z	1	* (MSL)) (AC)		(MSL)	FT	ς Υ)	* (MSL) (AC) * (MSL) FT CY) * (MGD)
NA-0626			DA= 1.	1.50 SQ MI	MI = S	AC.	USGS 0	UAD-	QUAD- STERLING MASS			LATIT	UDE 4	2-29-50	LONG	TUDE	LATITUDE 42-29-50 LONGITUDE 71-49-17
SITE	RAT ING	3	STREA	MATE	STREAM WATER QUALITY	(A)	100-YR P	PRIN SI	PWY DES	SPWY DESIGN STORM	-	RUNOFF =	8.10	= 8.10 IN. PEAK FLOW	AK FLOI	 TE	453 CFS
737.9	0	0.0		2		11.8 *	757.9	33	332 4.1	1830	* 759.5	•5 66	* *	761.2	35	54.*	*
752.5	100	1.2	5920	25	23540	26.5 #	0			2940	+ 757.4		*	758.8	33	45 #	0.25
757.4	290	3.5	2420	. 55	12830	31.4 *	759.9			7	* 761.7	!	*	763.2	37	62 *	0.48
762.0	029	8.3	1280	98	8680	36.0 *	10	E 94			* 766.0		*	767.5	41	82 *	0.78
7.991	1240	15.5	830	164	6320	40.7 *	1				4 769.9		*	771.5	46	108 *	1 - 04
770-7	2000	25.0	580	213	5470	* 1.44	773.2	E 2551	51 31.9			•5 220	*	775.3	64	137 *	1.25

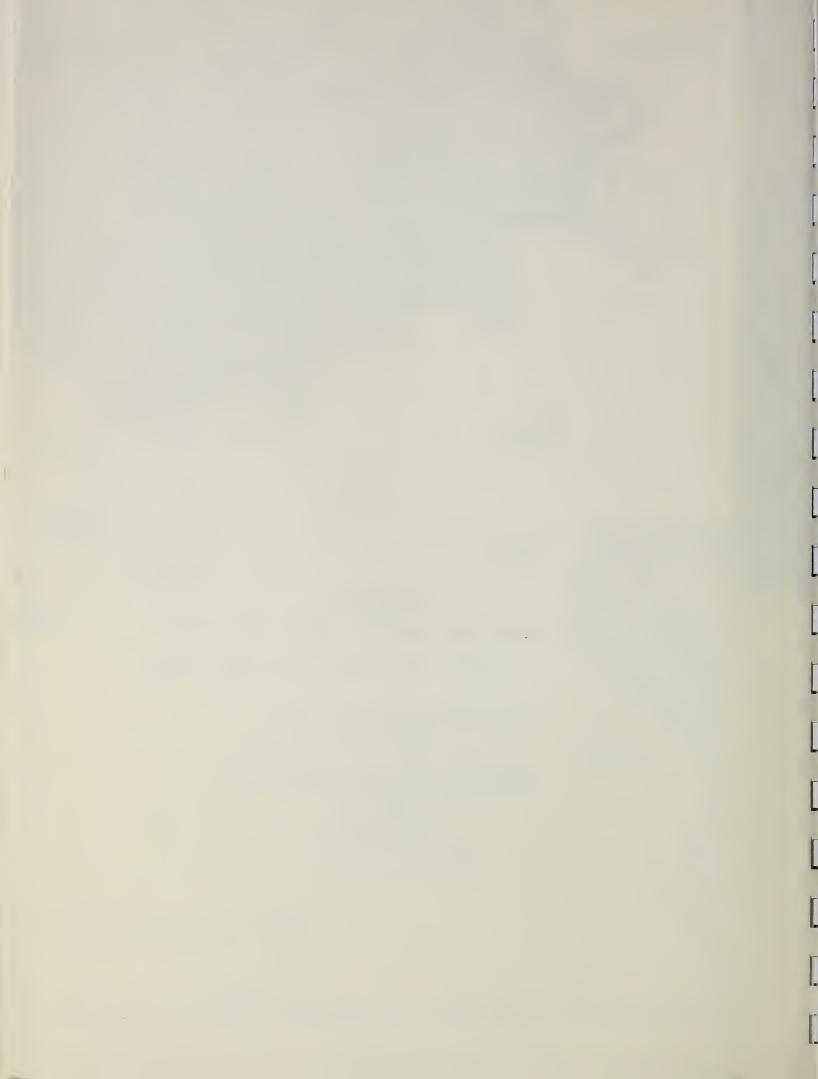
SITE	RATING	(3)	UA# Z.	EAM WATER	= QUAL	(A)	100-YR P	RIN SI	QUAD- SIEKLING MASS PRIN SPWY DESIGN ST	QUAD- SIERLING MASS PRIN SPWY DESIGN STORM		LAIII RUNOFF =	00e 4. 8.10	LAIIIUUE 42-29-46 LUNGII FF = 8.10 IN. PEAK FLOW	LUNGITUDE AK FLOW =	- UDE	71-51-20 604 CFS
							1					í	*				
699.5		0.0		- 3		5.5 *	~			1550			*	811.3	77	77	***
809.3	100 613	رم د د د د	1370	106	14740	9.0 *	807.5	л п 9 <u>6</u>	465 4.4 911 8.5	1600	* 809.5 * 813.8	.5 108	* *	811.7	18	32 *	0.28
815.7	1383	13.0	730	130	0622	21.7 *	818.2		~ (580	* 820.0			822.0	28	55 *	1.26
822.5	2331	21.9	530	147	8380	28.5 *	825.0	E 2717	17 25.5	450	* 826.6	.6 151		828.5	35	87 *	1.59
*******	***************************************	*	****	****	****	*****		-	2012110	*****	****	*	*	***	•	-	******
SITE	SITE RATING (1)		STREAL	LEAM WATER	= QUALI		100-YR P	PRIN SE	CLINION MASS	PRIN SPWY DESIGN STORM		RUNOFF = 8.	8.10	8.10 IN. PEAK FLOW	AK FLOW =	- UUE	11-43-13 181 CFS
																*	
416.2		0.0		2		4.3 *				5260			*	434.0	22		****
430.2	100	0 h	7310	14	52280	18.2 *				4990			*	435.0	23	8 ,	0.18
424.9	450	14.1	2340	27	28440	22 0 *	7.044	7 3	506 9.6	7600	* 441.5		* 67	442.5	30	4 14	67.0
451.0	730	22.7	1830	52	25710	39.0 *			876 27.4	1530				455.5	74	145 *	0.48
452.4	800	25.0	1750	56	25000	* 5.05	454.9	E 94	946 29.5	1480	* 455.7	9 2.	, * 99	456.9	45	160 *	0.50
NOTES -	(1) CO	COSTS ARE	E BASED ON	ON	(1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITE	DESIG	DESIGN CRITER	ERIA AN	AND COST DATA.	ERIA AND COST DATA.						i	
	(2) EM	EMERGENCY		JAY ST	STORAGE AND	ND COSTS	ARE BASED	ED ON	TOTAL	ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.	INCLU	DING B	ENEFI	IAL PO	0,		The state of the s
	(3) EM (4) TA	EMERGENCY TABULAR DA	Y SPILLWAY	MAY TY	EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION, FIGURES	- C=CONC	RETE CHU	TE, D	-CONCRE		E=EXC	AVATED	Y FOR	DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE SHOWN ARE PRIMARITY FOR COMPARISON PURPOSES.	LLWAYS	N= NONE	ONE
	(5) FI	EVATIO	ELEVATIONS ADE CHOUN TO THE	MUOUS	TO THE A	TODOG	TOOS	TO	JOU VAD		14111111	1	DOMERTIN	V 1140	OWA	ADE AID	T TO DE

ELEY STORAGE COST ACCOUNTS OF THE CREAT STORAGE COST COST COST COST COST COST COST COST		11	BENEFICIAL POOL). 	BENEFICIAL POOL * EMERGENCY SPILLWAY * DESIGN *			EMERGE	EMERGENCY SPILLWAY	LLWAY		* DES * HIGH	DESIGN HIGH WATER		DAM	DAM		* SAFE * YIELD
#\$£] AC FT IN (\$) * (MSL) (AC) * (MSL) FT CY) ***********************************	STORAGE		COST PER	AREA	COST/ SURF	DEPTH	* CRE		STORAGI AT CRES	1		ELEV	ARE	A + EL	P EV	НБТ	FILL	* A I 95 *PERCENT *CHANCE
DA= 2.20 SQ MI = 1408 AC USGS QUAD—CLINTON MASS	Z * * * * * *	2 *	(\$)	(AC)	(\$)	(FT)	SE) *	1, A	C FT	N +	(\$)	******	(AC		ISL)	FT	ζζ	* (MGD)
295.6 E 487 4:1 7190 * 297.7 34 * 299.5 37 151 * 282.4 E 163 1.4 20410 * 284.7 19 * 286.2 24 59 * 300.2 E 721 6.1 5.220 * 304.7 41 * 306.1 44 57 * 517 * 518.0 E 721 6.1 5.220 * 304.7 41 * 306.1 44 57 * 518.0 E 253 21.9 1890 * 336.5 80 * 328.0 7 7 7 744 * 335.0 E 2631 22.4 1870 * 337.2 81 * 338.7 7 7 744 * 335.0 E 2631 22.4 1870 * 337.2 81 * 338.7 7 7 7 744 * 34.8 * * * * * * * * * * * * * * * * * * *	(3)		DA# 2.2 STREAM	MATE	MI = 1.	408 AC	100-	SGS QUA	D- CLI	NTON M	ASS N STOR	RUNC	LATIT	UDE 42	1-26-12 IN. PE	LON AK FL	GITUDE	71-41-3 664 CFS
282.4 E 163 1.4 20410 * 284.7 19 * 286.2 24 59 * 302.2 E 721 6.1 5220 * 304.7 41 * 306.1 44 217 * 318.7 E 1508 12.8 2830 * 321.1 63 * 322.5 61 437 * 334.2 E 2573 21.9 1890 * 336.5 80 * 338.0 76 728 * 335.0 E 2631 22.4 1870 * 337.2 B1 * 338.7 7 7 7 44 * 335.0 E 2631 22.4 1870 * 337.2 E 81 * 338.7 7 7 7 23 11.8 370.0 E 259 2.3 6800 * 377.2 50 * 378.9 31 31 * 377.2 E 346 3.0 5160 * 377.4 4 * 376.1 28 20 * 377.0 E 259 2.3 6800 * 377.4 4 * 376.1 28 2.0 * 377.0 E 259 2.3 6800 * 377.4 4 * 376.1 28 2.0 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 31 30 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 26 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 377.0 E 259 2.3 6800 * 377.4 51 * 378.7 2 E 20 * 20 * 20 * 20 * 20 * 20 * 20 *		0.0	· mp.	9	1	1		5.6 E	487	4.1	7190			I [‡]	99.5	37	151	
318.7 E 1508 12.8 2830 * 321.1 63 * 322.5 61 437 * 334.2 E 2573 21.9 1890 * 336.5 81 * 328.7 77 744 * 334.2 E 2573 21.9 1890 * 336.5 81 * 338.7 77 744 * 334.2 E 2573 21.9 1890 * 337.2 81 * 338.7 77 744 * 44 * 44 * 44 * 44 * 44 * 44	-	0.8	33360	13	261430			1	163	1.4				*	86.2	24	59	
334.2 E 2573 21.9 1890 * 336.5 80 * 338.0 74 7 744 * 44 * 44 * 44 * 44 * 44 * 44	pare	1.6	3140	36	105770	37.8	* *			6.1 2.8	5220	304		* 4	22 5	44	217	* 0.86
335.0 E 2631 22.4 1870 * 337.2 81 * 338.7 77 744 * * * * * * * * * * * * * * * *		20.1	2060	73	1	9.69	33	. 01		21.9	1890	336		*	38.0	76	728	* 1.71
USGS QUAD- CLINTON MASS 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = ** * 375.2 E 465 4.1 3800 * 377.2 50 * 378.9 31 31 ** * 367.0 E 175 1.6 9940 * 369.4 32 * 370.7 23 15 ** * 370.0 E 259 2.3 6800 * 372.4 39 * 373.7 26 20 ** * 372.2 E 346 3.0 5160 * 377.4 51 * 376.1 28 24 ** * 375.0 E 458 4.1 3970 * 377.4 51 * 376.1 28 24 ** * 375.0 E 458 4.1 3970 * 377.4 51 * 376.1 28 24 ** * 375.0 E 458 4.1 3970 * 377.4 51 * 376.1 28 24 ** * 495.7 E 221 4.1 6480 * 497.0 35 * 498.9 15 10 ** * 495.7 E 221 4.1 6480 * 497.0 35 * 498.9 15 10 ** * 494.2 E 177 3.3 8270 * 496.2 34 * 497.7 14 9 ** * 501.9 E 458 8.6 3440 * 503.7 47 * 505.2 21 19 ** * 501.9 E 463 16.2 2040 * 511.5 61 * 512.9 29 43 ** * 518.0 E 1394 26.0 1450 * 511.6 ** * 519.8 E 1526 28.5 1370 * 521.0 81 * 520.8 37 85 **	- min	20.6	2030	4/	66250		1	w a	- 4	22.4	1870	- 1	- 4	* 4	138.7	77	744	* 1.72
375.2 E 465 4.1 3800 * 377.2 50 * 378.9 31 31 * 310.0 E 175 1.6 9940 * 369.4 32 * 370.7 23 15 * 370.0 E 259 2.3 6800 * 372.4 39 * 373.7 26 20 * 375.0 E 458 4.1 3970 * 377.4 44 * 376.1 28 24 * 375.0 E 458 4.1 3970 * 377.4 51 * 378.7 31 30 * * 375.0 E 458 4.1 3970 * 377.4 51 * 378.7 31 28 24 * 375.0 E 177 3.3 8270 * 497.0 35 * 498.9 15 10 * 494.2 E 177 3.3 8270 * 497.0 35 * 498.9 15 10 * 494.2 E 177 3.3 8270 * 496.2 34 * 497.7 14 9 * 501.9 E 458 8.6 3440 * 503.7 47 * 505.2 21 19 * 509.9 E 863 16.2 2040 * 511.5 61 * 512.9 29 43 * 518.0 E 1526 28.5 1370 * 521.0 81 * 522.5 38 97 * * 3870 * 521.0 81 * 522.5 38 97 * * 3870 * 521.0 81 * 522.5 38 97 * * 3870 * 522.5 38 97 * 3870 *	1	(3)	DA= 2.1 STREAM	WATE	MI = 1 R QUALI	344 AC TY (A)	100-	SGS QUA	D- CLII	NTON M	IASS N STORF		LATIT	UDE 42	10, PE	AK FL	IGITUDE OW =	71-43-1 634 CFS
36/60 E 1/5 1.6 9940 * 369.4 32 * 370.7 23 15 * 370.0 E 259 2.3 6800 * 372.4 39 * 373.7 26 20 * 372.2 E 346 3.0 5160 * 374.7 44 * 376.1 28 24 * 375.0 E 458 4.1 3970 * 377.4 51 * 378.7 31 30 * * * * * * * * * * * * * * * * * *		0.0		5		6.1	# 37		465	4.1	1			*	78.9	31	31	*
372.2 E 346 3.0 5160 * 374.7 44 * 376.1 28 24 * 375.0 E 458 4.1 3970 * 377.4 51 * 378.7 31 30 * 4 * 455.0 E 458 4.1 3970 * 377.4 51 * 378.7 31 30 * 4 * 455.0 E 458 BURY MASS LATITUDE 42-20-41 LONGITUDE 0-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 494.2 E 177 3.3 8270 * 497.0 35 * 498.9 15 10 * 494.2 E 177 3.3 8270 * 496.2 34 * 497.7 14 9 * 491.0 E 458 8.6 3440 * 503.7 47 * 505.2 21 19 * 509.9 E 863 16.2 2040 * 511.5 61 * 512.9 29 43 * 519.8 E 1526 28.5 1370 * 521.0 81 * 522.5 38 97 * * 482.8		1.5	10460	27	65540	19.5	* 37		259	2.3					73.7	26	20	
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Notes





NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-7, Nashua River

This subwatershed covers about 26,100 acres in the Bolton, Groton, Harvard, Lancaster, in Worcester County and Ayer and Shirley, in Middlesex County. Portions of Fort Devens, a U.S. Army Installation, lie within the subwatershed.

The Nashua River flows generally northerly through Fort Devens and Harvard.

The main tributary in the subwatershed is Bowers Brook which originates above Bare Hill Pond and flows northerly to Grove Pond in Ayer and then westerly to the Nashua River. Elevations range from a high of about 640 in Bolton to about 230 on the Nashua River floodplain. Geology within the subwatershed is variable consisting of schist, granitic gneiss or phyllite bedrock overlain by 15 to 50 feet of glacial till or outwash sand and gravel.

Seventeen potential reservoir sites and seven existing reservoirs were studied. Design summaries are included for 12 potential sites that met study criteria.

SITE NA-0701

Location:

On a tributary to the Still River approximately 500 feet upstream from Still Forbush Mill Road in Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°26'46" Longitude: 71°38'12"

Facilities Affected:

About 1100 feet of an unnamed gravel road, below elevation 400.

Geologic Conditions:

The left abutment is outwash with schist bedrock outcrops near the stream on the left and outwash high on the abutment. The right abutment is outwash, probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 15 to 20 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches in size may run 15 percent. Waterholding capabilities appear to be poor.

SITE NA-0701 (Cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0702

Location:

On a tributary to the Nashua River at Bolton-Harvard town line approximately 100 feet upstream from Route 110 in Bolton and Harvard, Massachusetts.

Clinton-Hudson, Massachusetts Quadrangle

Latitude: 42°28'23"

Longitude: 71°37'30"

Facilities Affected:

Below Elevation 270

Below Elevation 260

6 houses

3 houses

2 sheds

1250 feet of Vaughn Hill Road

Below Elevation 255

1 house

Geologic Conditions:

The left abutment is schist bedrock at high elevations and englacial drift at lower elevations and is shallow to bedrock. The right abutment is glacial till, probably shallow to bedrock, and swampy at low elevations. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run 30 percent. Waterholding capabilities appear fair if a positive cutoff can be made through the swamp deposits in the foundation and low on the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Bowers Brook approximately 600 feet upstream from West Bare Hill Road in Harvard, Massachusetts

Hudson, Massachusetts Quadrangle

Latitude: 42°28'28" Longitude: 71°36'09"

Facilities Affected:

Below Elevation 395
5 houses
800 feet of West Bare Hill Road

Below Elevation 390
3 houses
250 feet of West Bare Hill Road

Below Elevation 385
2 houses

Below Elevation 380
1 house

Geologic Conditions:

The left abutment is glacial till, probably shallow to bedrock, with swamp at the lower elevations. The right abutment is glacial till at high elevations, outwash around till at middle elevations, and swamp at low elevations. Depth to granitic bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems low on the right abutment and in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches in size may run 50 percent. Waterholding capabilities appear fair provided a cutoff is made to glacial till or bedrock beneath outwash on the left abutment and swamp.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

At outlet end of marsh draining into Bare Hill Pond at southwest end of pond in Harvard, Massachusetts.

Hudson, Massachusetts Quadrangle

Latitude: 42°28'51" Longitude: 71°36'19"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (287 acres). Therefore, no further investigations were made.

SITE NA-0705

Location:

On a tributary to the Nashua River in Fort Devens Military Reservation, approximately 6800 feet upstream from Nashua River in Lancaster, Massachusetts.

Clinton, Massachusetts Quadrangle

Latitude: 42°29'09" Longitude: 71°38'49"

Facilities Affected:

No facilities affected below elevation 250.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to phyllite bedrock in the foundation is not known, but is probably 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash sand and gravel on both abutments and swamp on the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

The entire site is owned by the U.S. Army.

Location:

On a tributary to Nashua River approximately 1600 feet upstream from Union Turnpike on the Fort Devens Military Reservation in Lancaster, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°30'19" Longitude: 71°39'21"

Remarks:

Drainage Area: 560 Acres
This site was eliminated from further study
since it is located on the Gunnery Impact area
of the Fort Devens Military Reservation.

Public Ownership:

The entire site is owned by the U.S. Army.

SITE NA-0707

Location:

On a tributary to the Nashua River on Fort Devens Military Reservation approximately 300 feet upstream from Jackson Road in Lancaster, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°30'53" Longitude: 71°38'13"

Facilities Affected:

Below Elevation 240

1725 feet of Old Shirley Road 550 feet of Union Turnpike

Below Elevation 235

1150 feet of Old Shirley Road

Below Elevation 230

650 feet of Old Shirley Road

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash on both abutments.

Engineering Notes:

The recommended location for an emergency spill-way is at the right abutment. The U.S. Army has built a shallow fish and wildlife pond at this site. The pool is known as Slate Rock Pond and has a surface area of about 5 acres. Waterholding capability above the present pool level appears poor.

SITE NA-0707 (Cont'd)

Public Ownership:

The entire site is owned by the U.S. Army.

SITE NA-0708

Location:

On a tributary to the Nashua River approximately 700 feet upstream from Route 2 in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°31'13" Longitude: 71°38'31"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (233 acres). Therefore, no further investigations were made.

SITE NA-0709

Location:

On Bower Brook approximately 300 feet upstream from Route 2 in Harvard, Massachusetts.

Ayer, Massachusetts Quadrangle

Longitude: 71°34'24" Latitude: 42°31'18"

Facilities Affected:

Below Elevation 290 Below Elevation 310 10 houses 25 houses 15 barns and sheds 7 barns and sheds 3 garages 2 garages 1 service station 425 feet of Route 110-111 1650 feet of Route 110-111 5100 feet of Littleton Road 600 feet of Mill Road 1600 feet of an unnamed road 5100 feet of Littleton Road 2400 feet of Whitney Road 1600 feet of an unnamed road 2400 feet of Whitney Road Below Elevation 280 6 houses

Below Elevation 300 16 houses

13 barns and sheds

3 garages

250 feet of Route 110-111 5100 feet of Littleton Road 1600 feet of an unnamed road

1150 feet of Route 110-111 5100 feet of Littleton Road 2400 feet of Whitney Road

1600 feet of an unnamed road

2400 feet of Whitney Road Below Elevation 270

4 houses 1 garage

4 barns

2 garages

5100 feet of Littleton Road 1600 feet of an unnamed road 2400 feet of Whitney Road

SITE NA-0709 (Cont'd)

Geologic Conditions:

The right abutment is poorly graded fine and medium grained sand outwash. The left abutment is silty sand glacial till at high elevations and outwash sand and gravel at medium and low elevations. Depth to granitic gneiss bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 5% of the site is owned by the Town of Harvard.

SITE NA-0710

Location:

On Bowers Brook approximately 1400 feet upstream from Barnum Road in Harvard, Massachusetts. Portion of this site is on Fort Devens Military Reservation.

Ayer, Massachusetts Quadrangle

Latitude: 42°32'54" Longitude: 71°34'41"

Remarks:

Drainage Area: 7163 Acres
This site was eliminated from further study because of the high cost of relocating a complex of Fort Devens Army buildings and a portion of the Boston and Maine Railroad.

Public Ownership:

Portion of this site is on Fort Devens Military Reservation.

NA-0711 -- UPPER FLANAGAN POND

Location:

150 feet north of Flanagan's Pond in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Surface Area (Acres)	
13	

Height of Dam
(Ft.)
8

Dr	ainage Area
(Acres)	(Sq. Mi.)
510	0.80

Potential

for

Expansion:

Size of pond could be tripled with little effect on facilities.

Remarks:

This structure appears to be a mill dam constructed of field stone and patched with brick at a later date. A small weir serves as the principal spillway, with high flows going over the entire length of the dam.

Geologic Conditions:

The right abutment is thin discontinuous englacial drift, shallow to granitic gneiss. The left abutment is thin, poorly graded sand and gravel outwash, shallow to granitic gneiss. There is an outcropping of granitic gneiss at the centerline of the damin the brook. There is a leakage problem low on the left abutment. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good providing a cutoff is made to bedrock beneath the outwash sand and gravel on the left abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

On Walker Brook approximately 2500 feet upstream from Walker Road in Shirley, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°33'38" Longitude: 71°37'22"

Facilities Affected:

Below Elevation 260

5 powerline towers 1200 feet of Walker Road

Below Elevation 255

4 powerline towers

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known, but may be 30 to 40 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Morse Brook approximately 6200 feet from Walker Road in Shirley, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°33°29" Longitude: 71°37'59"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (276 acres). Therefore, no further investigations were made.

SITE NA-0714

Location:

On a tributary to the Nashua River on Fort Devens Military Reservation, approximately 1400 feet upstream from Nashua River in Lancaster, Massachusetts.

Clinton Massachusetts Quadrangle

Latitude: 42°29'38" Longitude: 71°38'01"

Facilities Affected:

Below Elevation 240

500 feet of Harvard Road gravel pit on left abutment

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash. Depth to phyllite bedrock in the foundation is not known, but may be 15 to 25 feet. There is a leakage problem in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash sand and gravel on both abutments.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. The U.S. Army has built a shallow fish and wildlife pool at this site. The pond is known as Cranberry Lake and has a surface area of about 65 acres. Water-holding capability above the present pool level appears poor.

Public Ownership:

The entire site is owned by the U.S. Army.

Location:

On a tributary to the Still River approximately 2200 feet downstream from Green Road in Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42°27'20" Longitude: 71°37'45"

Facilities Affected

No facilities affected below elevation 380.

Geologic Conditions:

Both abutments are poorly graded sand and gravel and swampy along the stream. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems on both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 10% of the site is owned by the Town of Bolton.

SITE NA-0716

Location:

On a tributary to the Still River approximately 1200 feet upstream from Still River Road in Bolton, Massachusetts.

Clinton, Massachusetts Quadrangle.

Latitude: 42 27'49" Longitude: 71 37'52"

Facilities Affected:

No facilities affected below elevation 300.

SITE NA-0716 (Cont'd)

Geologic Conditions:

The right abutment is a sandy silt and poorly graded sand and gravel outwash. The left abutment is poorly graded sand and gravel outwash with schist bedrock outcropping on the left streambank. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good, provided a cutoff is made to glacial till or bedrock beneath the sand terrace low on the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. The right abutment of the dike is on schist bedrock. The left abutment of the dike is the same as for the dam.

SITE NA-0717

Location:

On a tributary to the Nashua River approximately 2000 feet downstream from Route 2 on Fort Devens Military Reservation in Lancaster, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°30'49" Longitude: 71°39'05"

Facilities Affected:

1500 feet of an unnamed road between Union Turnpike and Old Shirley Road.

Geologic Conditions:

The right abutment is silty sand glacial till. The left abutment is thin, poorly graded fine sand outwash underlain by silty sand glacial till -- shallow to phyllite bedrock. Depth to phyllite bedrock in the foundation is not known, but may be 5 to 10 feet. There is a leakage problem in the foundation. Impervious borrow material for dam construction is available on site.

(Contid) SITE NA-0717

Geologic Conditions: (cont'd)

Waterholding capabilities appear good provided a cutoff is made to bedrock beneath swamp in the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

The entire site is owned by the U.S. Army.

SITE NA-0718

Location:

On a tributary to Morse Brook approximately 200 feet upstream from Patterson Road in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle.

Latitude: 42°33'19"

Longitude: 71°37'52"

Facilities Affected:

Below elevation 270

Below elevation 260 4 houses

6 houses 27 trailers 2 garages

27 trailers l garage 5 barns and sheds 3 barns and sheds

300 feet of Clark Road 300 feet of Clark Road

Below elevation 265

Below elevation 255

5 houses 27 trailers

2 garages

3 barns and sheds 300 feet of Clark Road

1 house 26 trailers

Geologic Conditions:

Both abutments are sand and gravel deposits (kame terrace). Depth to schist bedrock in the foundation is not known, but probably is deep. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

NA-0719 -- BARE HILL POND

Location:

Between Routes 110 and 111 in Harvard, Massachusetts.

Hudson, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainag	e Area
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
350	6	2370	3.7

Potential for

Expansion:

Expansion appears possible, but large surface area might cause substantial evaporation losses.

Remarks:

This is an earth-fill dam. Upstream face is rock riprapped. There is a 10 foot wide spillway with concrete sidewalls and ledge floor. Principal spillway is a 10 foot wide concrete weir with 2 bays. Structure appears to be in good condition except for trees and brush growing on the downstream slope.

NA-0720 -- LONG POND

Locatipn:

Upstream of Sandy Pond near the Groton-Ayer town line in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Surface Area (Acres)	Height of Dam (Ft.)	Drainage Area (Acres) (Sq. Mi.)	
60	8	590 0.92	

Potential for Expansion:

Expansion appears possible. Small drainage area will limit extensive expansion.

Remarks:

The pond is very shallow at the dam. Structure is an old mill dam with vertical downstream face of granite blocks. Spillway is a 10 foot weir. There are trees growing on the dam and there is leakage visible downstream.

NA-0721 -- SANDY POND

Location:

Upstream of Snake Hill Road in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle.

Remarks:

Snake Hill Road separates Sandy Pond from Flanagan Pond. (NA-0722). Both ponds are at the same elevation. Water level is controlled by the Flanagan Pond outlet.

Notes

NA-0722 -- FLANAGAN POND

Location:

Upstream of Central Avenue in Ayer,

Massachusetts.

Ayer, Massachusetts Quadrangle

Surface Area	Height of Dam	Drainage	Area
(Acres)	(Ft.)	(Acres)	(Sq. Mi.)
155	8	2370	3.7

Potential for

Expansion:

Limited by roads, railroad, houses, and cottages. See Site NA-0711 which appears to have expansion potential.

Remarks:

Sandy Pond and Flanagan Pond are separated by a causeway (Snake Hill Road). Sandy Pond flows into Flanagan Pond through a culvert. Flanagan Pond flows under the railroad into Balch Pond. The water control structure for all the ponds is just south of East Main Street. The spillway is a granite-block weir about 20 feet wide with a 10 foot drop.

NA-0723 -- GROVE POND

Location:

Between the Boston and Maine Railroad and

Barnum Street in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle.

Remarks:

Grove Pond is just upstream of NA-0724, Plow Shop Pond. The dam and spillway at Plow Shop Pond controls the water level in both ponds.

Notes

NA-0724 -- PLOW SHOP POND

Location:

Between two branches of the Boston and Maine Railroad in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
114	6	11,900	18.6

Potential for

Expansion:

Expansion does not appear practical. Both abutments are pervious outwash sand and gravel. The shoreline is developed and inundated facilities would be extensive.

Remarks:

The spillway, a concrete weir about 50 feet long, controls the water level in Plow Shop Pond and Grove Pond (NA-0723). Spillway is in fair condition, sidewalls are cracked.



													-2	02	-											
EMERGENCY SPILLWAY * DESIGN * DAM * SAFE * HIGH WATER * * YIELD	*PERCENT	*CHANCE	* (MGD)	de f	*		* 0.34	* 0.48	* 0.59	74•1 C 1103 C0·4 1130 F 370•2 33 F 377•1 33 502 F 0·01 ***********************************	71-37-30 290 CFS	* *	* 0.21	* 0.43	* 0.62	10.79	中央市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市	293 CFS		* 0.21	* 0.43	* 0.62	* 0.77	63 * 0.80		N= NONE
	FILL	VOL	CY)	GITUDE	H	4	27	118	268	206	LONGITUDE	57	39	99	199	355	******	LONGITUDE	l	19	28	41	58	63		S N=
DAM	****	НСТ	FT	46 LO	PEAR	22			53	25	23 LOI PEAK FI	16				40	*****	28 LONGI PEAK FLOW		12			24	25	P00L.	PILLWA
	***** TOP		(MSF)	42-26-	BACO IN PEAN FLUM	365 6	376.2	387.7		1.666	JDE 42-28-23 LONGI 8.20 IN. PEAK FLOW	244.5	240.8	250.2	259.2	269.6	******	DE 42-28- 8-20 IN-		382.5	386.9	390.1	393,7	394.5	FICIAL	FUR COM
SN *	*****	AREA *	(AC) *	LATITUDE 42-26-46 LONGITUDE	;	* 41		39 *	53 #	******	LATITUDE 42-28-23	36	1	41 #	57 *	77 *	******	LATITUDE 42-28-28 FF = 8.20 IN. PE.		80 *		117 *	136 *	140 *	4G BENE	ARE PRIMARILY FOR COMPARISON PURPOSES
* DESIGN * HIGH WATER	****	ELEV	(MSL)	7	E TAUNON	366.1	374.7	385.5	394.6	7.046	MA LA	240-8	239.2	247.7	256.5	266.5	*****	RUNOFF	1	379.9	383.4	386.7	390.6	391.4	NCLUDI	EXCAV
* *	AT STORAGE AND COST A PERSON COST A PERSON OF THE PERSON	PER *	* (\$)	QUAD- CLINTON MASS	* 0000	3490 *	- 1	1450 *	1230 #	* 06TT	USGS QUAD- CLINTON MA-HUDSON O-YR PRIN SPWY DESIGN STORM	7320 *	* 0206	4180 *	2570 *	1740 *	*******	SS N STORM		2830 *		* 068	* 099	91.0 E 1620 31.5 620 # 391.4 140 # 394.5 25 ***********************************	DATA. STORAGE. INCLUDING BENEFICIAL POOL.	
EMERGENCY SPILLWAY	IGE		Z	QUAD- CLINTON MASS	N DESTR	3.6			26.0	*******	USGS QUAD- CLINTON MA-HUDSO	4.1			16.1	1449 28.5	******	SGS QUAD- HUDSON MASS -YR PRIN SPWY DESIGN		1 9 9		18.7	29.0	31.5	AND COST DA	E CHUTE, D=CONCRETE DROP, NEDRMATION, FIGURES SHOWN
GENCY	STORAGE	AT CREST	AC FT	UAD- CL	NIN OF	F 163	E 331		E 1013	.011	UAD- CI	F 210				F 1449	*****	UAD- HU	1	F 234	E 548			E 1620	IA AND	E CHUTE, D=(
EMER		* ELEV		USGS		361.7	372.4	383.1	392.2		USGS C	238.3	236.7	245.2	254.1	264.2		USGS QUAD- 100-YR PRIN		377.6	381.7	385.7	390.1			
* *	李章年中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中中	AT *		R .	*	15.2 *	25.9 #	36.5 #	45.8 *	r è	1	* *	6.3 *	14.7 *	23.6 *	33.7 *	中华中华中华中华中华中华中华中华中华中华中华中华中华中华中华中华中华中华中华	4 AC	*	1.0 *	9.2 *	13.2 *	17.6 *	1280 25.0 (80 126 126 1950 187 25.4 3	• DESIGN C D COSTS AR	
	COST/	SURF	(\$)	1 4 1 6	ACAL I	25880	31240	29660	26830	C**T* 00607 64 0CCT 0*CZ C16 0*T4C	= 0.95 SQ MI = 608 AC STREAM WATER QUALITY (B)		66830	54360	44150	37080	*****	= QUALI		16190	10200	8740	8090	1950	1971 S.C.S. STORAGE AND	E CODE-
5	****	AREA	(AC)	0.73 SQ MI		14	18	31	94	****	0.95 SQ MI	00	23	33	47	68	******	= 0.96 SQ MI STREAM WATER	,	6 [4	74	86	121	126	MAY STOR	WAY TYPE BASEL
BENEFICIAL POOL	********COST	PER AC FT	(\$)	DA= 0	S I NE	7667	2080	1690	1410	1000	DA= 0.		15180	5370	3050	1980	*****	DA= 0. STREA		6620	2250	1240	840	08/	E BASED ON Y SPILLWAY	Y SPILLWAY
BENEFICIAL POOL *	* * * * *	STORAGE	N	167	C S	0.0			22.1	D*C7	(3)	0.0				25.0	*****	(2)		2.0			ı	75.0	COSTS ARE	EMERGENCY TABULAR DA
	***	STO	AC FT	1	NA LING	0 0	275	537	886	*****	-0702 SITE RATING	0	100	333	683	1267	*****	RATING	(100	336	069	1162	1780	(2) EI	(3) EI (4) T/
	*****	ELEV	(MSF)	NA-0701		359.2	369.9	380.6	389.7	27T * 0	NA-0702 SITE	228.7	234.2	242.7	251.6	261.7	****	NA-0703 SITE		375.1	379.2	383.2	387.6	288°2 *****	NOTES -	

* DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. *

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

*		BENEFI	BENEFICIAL POOL	70		BENEFICIAL POOL *		EMERGENCY		SPILLWAY	*	DES	DESIGN		EMERGENCY SPILLWAY * DESIGN * DAM	5	*	SAFE
	***	***	***	* * * * *	中海市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市市	***	***	車車	本 HIGH MATER 本	* * * * *	* * * * * * * *	* HIGH WATER	MATER	* *	*	***	¥.	YIELD AT 95
ELEV	STORAGE	AGE	PER	AREA	SURF	DEPTH	* CREST * ELEV		STORAGE AT CREST		COST *	ELEV	AREA	* TOP		HGT V	FILL *	-*PERCENT *CHANGE
			AC FT		AC	DAM	** TYPE				AC FT *			*			00	
	AC FT	ZI	(WST) AC FT IN (外) (AC) (外)	(AC)	*	(FT)	* (MSL)) AC	FT	Z	* (\$)	(MSL)	(AC)	E .	(MSL)	FT	CY) *	(MGD)
NA-0705	RATING	(3)	DA= 0. STREA	0.99 SQ		634 AC TY (B)	USGS 100-YR	S QUAD-	SPWY S	CLINTON MASS	CLINTON MASS SPWY DESIGN STORM	LAI	LATITUDE	DE 42	DE 42-29-09 LONGITU	LONGITUDE	I TUDE	71-38-49
1								1 9			*			*			*	
10,777	0	0.0	0000	Σ .	000,	101					- 1		1	*	239.8	14	\$ 52	***
235.7	344	6.5	2130	40	9790	9.4	* 238.2 * 238.2	» с. п п	565 10	10.7	1300 *	239.8	3 81 8 110	* *	243.2	13	37 *	0.21
238.5	588	11.1	1340	98	8040	12.5	* 241.0	ш (910 *	242.2		*	245.6	20	* 14	0.59
247.5	1025	19.4	850	110	7300	16.5	* 245.0	1 11	1363 25	25.4	650 *	245.7	7 131	* *	248.5	77	* 09 -	0.75
	*****	*****	*****	*****	非非常非常非常非常的的	*****		おおおおお本		****	****		*****	****	こう イン・ にっしょう アン・ソン・アン・アン・アン・アン・アン・アン・アン・アン・アン・アン・アン・アン・アン	******	*	*****
NA-0707 SITE RI	RATING	(3)	DA= 2. STREA	2.32 SQ MI =	= 2.32 SQ MI = 148 STREAM WATER QUALITY	1485 AC ITY (B)		S QUAD-	QUAD- SHIRLEY MASS PRIN SPWY DESIGN S	SHIRLEY MAS	SS STORM	RUNO	LATITUDE FF = 8.		DE 42-30-53 LONGITUDE 8.20 IN, PEAK FLOW =	LONG 4K FLO	w l	71-38-13 709 CFS
221.1	c	0		11		6	* 232.R	a.	513	4.1	* 0212	235.3	80	* *	238.2	20	* *	
225.6	100	0.8	11070	34	32790	7.6		1							236.7	19	1	0.29
228.3	215	1.7	5260	48	23550	10.3	# 232.8	•8 E	513 4		2200 *		3 98	* 2	237.5	19	12 *	0.48
230.6	330	3.6	3540 2570	60	19400	12.6	* 235.1 * 235.0	.1 E .0 E	669	5.6	1670 * 1710 *	237	.3 113	* *	239.8	22 21	15 *	0.62

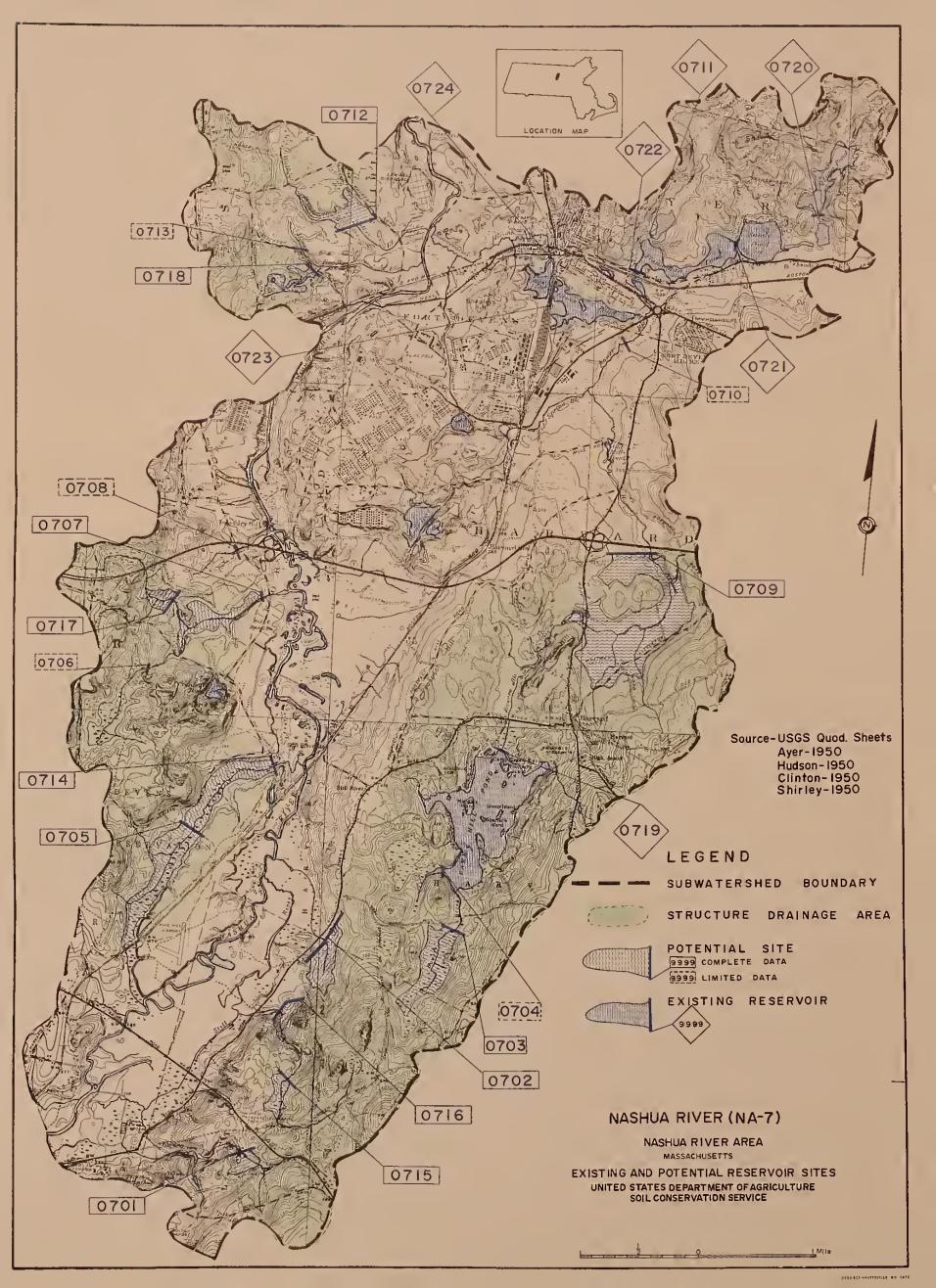
NA-0709			DA= 7.	7.48 SQ MI	4 = IW	4787 AC	USGS	S QUAD-	USGS QUAD- AYER MASS LATITUDE 42-31-18 LONGITUDE 71-34-24	AYER MASS			LATITUDE	DE 42	42-31-18	LONGITUDE	ITUDE	71-34-24
SITE RI	RATING	(2)	STREA	STREAM WATER	R QUALITY	TY (B)	100-YR	R PRIN		SPWY DESIGN	STORM	RUNDEF	н	8.20	20 IN. PE/	PEAK FLOW	11	1676 CFS
	c	6		C			* :	L		0	* :	010		# 1	, , ,	C	* 1	1 1 1
252.2	100	0.3	4240	41	10410	8.2	* 254.7	u	278 (0.7	1530 #	257.1	1 90		259.0	15	200	0.41
268.9	2075	5.1	290	192	0609	24.9	* 277.4	ı uı		10.0	* 262	279.9	2		283.6	40	* 69	2.95
281.7	5037	12.6	350	265	6620	37.8	* 288.2	ш	1	17.4	250 *	290.7		*	294.7	51	136 *	4.71
294.7	8986	22.5	290	348	7500	50.8	* 299.2	ш		26.7	240 *	301.7		*	306.0	62	268 *	6.02
297.5	9973	25.0	270	370	9973 25。0 270 370 7260 53。5 年 25 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	53.5		.0 E 1	300°0 E 10973 27°5 240 + 302°5 412 + 305°0 61 ***********************************	27.5	240 +	302.5	5 412	* 3	305.0	*	255 *	* 6.22
NOTES -	(1) CO	COSTS ARE	E BASED ON	01 NO	1971 S.C.S.	S. DESIGN		CRITERIA	AND COST DATA.	ST DAT	A .	0.4	430 0141	0.00	200	-		
		EMERGENCY		WAY TY	SPILLWAY TYPE CODE-	୍ବାଦ	CRETE (CHUTE.	TE CHUTE, D=CONCRETE	CRETE	DROP.	F=FXCA	TE DROP. F=FXCAVATED. T= TWO SPILLW	T= T	TWO SPIN	SPILL WAYS.	II Z	NONE
	- 1	BULAR	DATA AR	E BASE	TABULAR DATA ARE BASED ON PRELIMINARY	ELIMINA) l	INFORMATION.	ON. FI	FIGURES	SHOWN	ARE PR	ARE PRIMARILY FOR COMPARISON PURPOSES.	Y FOR	COMPA	SI SON	PURPOS	ES
	(5) EL	ELEVATIONS	ARE	SHOWN	SHOWN TO THE	NEAREST 0.		1 F00T T0	TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY,	VARIAT	ION BE	LEED	DEVELOR	PMENT	S ONLY	AND .	AND ARE NOT TO	T TO BE

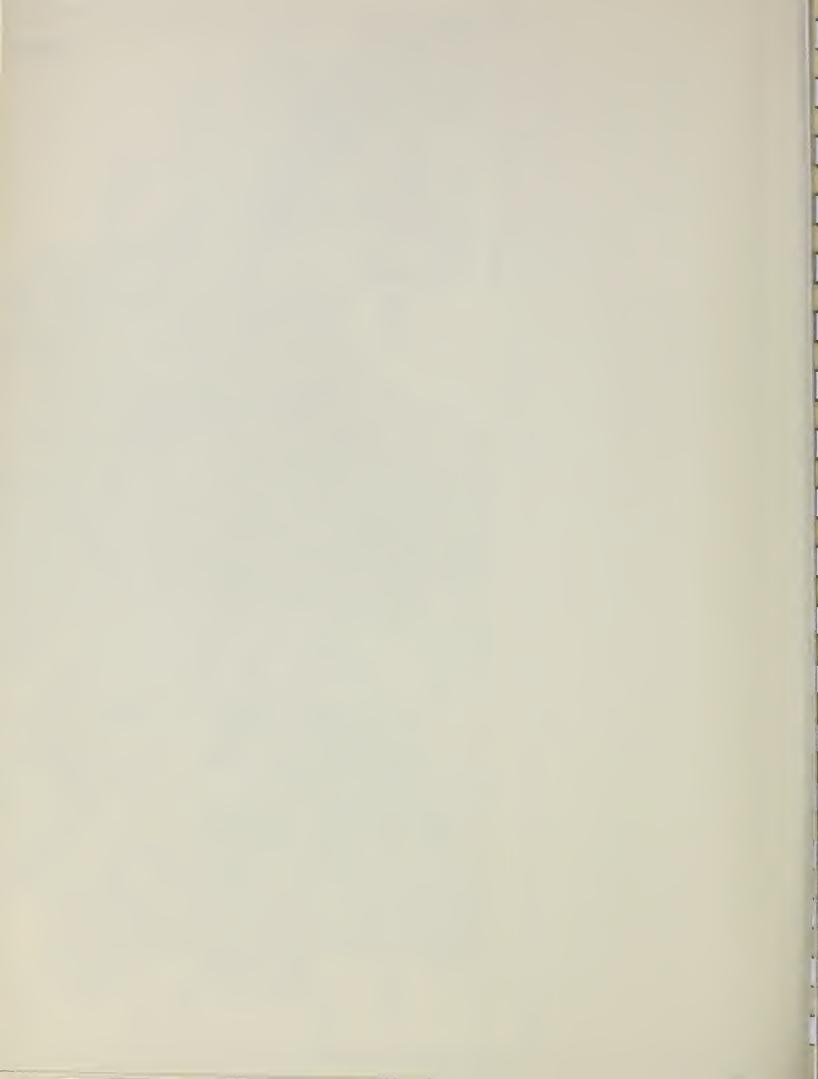
######################################			BENEFI	BENEFICIAL POOL	_		BENEFICIAL POOL * EMERGENCY SPILLWAY * DESIGN * DAM	* E	MERGEN	EMERGENCY SPILLWAY	LWAY		DESIGN	I GN	*	DAM		* SAFE	H 11
STORAGE OST COST DEPTH & CREST STORAGE COST												華	HIGH	MATER	*			* YI	d l
STORAGE COST ACET TO THE COST ACET STORAGE COST ACET ACET ACET ACET ACET ACET ACET ACE	******	*****	*****	******	*****	*****	******		*****	*****	*****	*****	******	*****	* * * * *	******	*****	*** AT	95
STURAGE PER AREA SURF AI				COST		C0ST/		5	-	TORAGE		-			*			*PER	CENT
AC FT IN (\$1) (AC) (\$1) (FT) (HSL) AC FT IN (\$1) (HSL) (AC) (HSL) FT CO) BATTING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPYTOESIGN SIRM RUNGE = 8.20 IN. PERK ELDH = 6.5 5.00-8. 243.6. 25.4. 244.5. E. 441.7. 2. 200.7. 71 18110 2.2. 0. 244.5. E. 441.7. 2. 200.7. 253.3. 29. 249.5. E. 1024.11.9. 1190. 255.7. 76. 253.3. 29. 186. 283.9. 14.6. 1470. 70. 17350. 28.5. 28.5. E. 1024.11.9. 1190. 255.7. 76. 253.3. 29. 186. 283.9. 14.6. 1470. 70. 17350. 28.5. 5.5. 0. E. 1024.11.9. 1190. 255.7. 76. 253.3. B. 10. 10. 253.1. 11. 200. 21. 11. 200. 21. 11. 200. 28.5. 28.5. 255.0. E. 1152. 20.2. 1090. 256.9. 91. 259.7. 36. 136. 28.5. 28.3. 29. 10. 253.9. 10.	ELEV	STUR	AGE	PEK AC ET	AREA	SURF		* ELEV		I CRES		H	_	AREA	* 4				S C I
RATING (3) DA= 1,07 SQ HI = 665 AC USGS QUAD—AVER HASS 0 0.0 0 4 4 6.5 = 240.2 E RIN SPHY DESIGN SIDRH RUNGF = 8.20 LIN. PEAK LIN. = 6.5 E LOGITUDE 0 0.0 1.7 R30 2 9 2 2700 12.6 = 239.1 E 193 3.4 6.50 = 246.1 5 6.2 249.2 2 5.6 0 317 9.1 2.0 7 1310 12.0 = 249.5 E 193 3.4 6.50 = 246.1 5 6.2 249.2 2 5.6 0 318 9.1 4.6 1470 70 17350 2 26.9 2 253.3 E 1024 12.9 130 = 255.7 86 = 258.9 3 = 129 943 16.5 1330 76 16.5 3 26.9 2 253.2 E 1024 12.9 190 = 255.7 86 = 258.9 3 = 129 943 16.5 1330 76 16.5 3 26.9 2 253.2 E 1024 12.9 190 = 255.7 86 = 258.9 3 = 129 944 16.5 1330 76 16.5 3 26.9 2 253.2 E 1024 12.9 190 = 255.7 86 = 259.7 36 = 136 945 16.5 1330 76 16.5 3 26.5 2 25.0 E 1152 20.2 1090 = 256.9 91 = 259.7 36 = 136 948 16.5 1330 76 16.5 3 25.5 E 1152 20.2 1090 = 255.7 86 = 259.9 100 949 16.5 1330 76 16.5 3 25.5 E 1152 20.2 1090 = 255.7 10 10 = 259.7 36 = 136 949 16.5 1330 76 16.5 3 25.5 E 1152 20.2 1090 = 255.7 10 = 259.7 36 = 136 949 16.5 1330 76 16.5 9 25.5 E 1152 20.2 1090 = 255.7 10 = 259.7 36 = 136 949 16.5 1330 76 16.5 9 25.5 E 1152 20.2 1090 = 255.7 10 = 259.7 36 = 136 940 1.1 2530 44 5720 6.0 226.5 E 848 9.0 500 = 235.5 128.3 20 = 15 941 16.5 130 76 16.5 5 9 12 1 2 230.1 E 555 5 5 9 0 235.5 136 = 239.3 10 = 10 940 1.1 2530 44 5720 6.0 225.5 E 1207 12.8 460 = 235.7 187 = 239.7 12 941 16.5 10.0 100 45.2 12.2 12.2 12.8 460 = 235.7 187 = 239.7 12 942 16.0 0.0 0 10.0 100 450 0 12.2 12.1 12.2 12.0 1000 0 12.2 12.1 12 943 16.5 10.0 10.0 42.2 12.2 12.2 12.2 12.2 12.2 12.2 12.2	(ISW)	AC FT	Z		(AC)	(8)		ISW) *					1	(AC)	*			*	100
RATING (3) STREAM WATER QUALITY (8) 100-YR PRIN SPMY DESIGN STDBH RUNDEF = 8.20 IN. PERK FLOW = 1.07 SQ N II = 665 G 0.02 PRIN SPMY DESIGN STDBH RUNDEF = 8.20 IN. PERK FLOW = 1.00 0.0 0.0 0.0 1.7 7830 29 27300 12.6 8 239.1 E 133 3.4 4050 244.5 46 8 243.6 20 33 4 5 5 6 6 6 1 1 2 2050 47 19310 12.6 8 249.5 E 40.5 11.8 1530 8 256.7 70 8 253.3 2 9 86 9 1 1 2 20.0 1 1 2 2 2.0 8 249.5 E 1024 II.2 11.0 0.0 2.0 2.0 24.5 E 4.0 11.0 0.0 25.0 10.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0	*****	****	*****	*******	*****	******	******	*****	*****	******	*****	*****	*****	*****	*****	******	****	****	* * * *
ATTING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN SIDRH RUNDEF = 8.20 IN, PEAK FLDH = 0.0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	NA-0712				7 50 1	"	685 AC	USG		- AYER	MASS			LATITU	DE 42-		LONGITU		37-22
100 1.7 7830 29 2700 12.6 239.1 E 193 3.4 4050 241.5 46 245.6 20 33 39 51.4 2500 21.4 2500 12.6 239.1 E 193 3.4 4050 241.5 46 245.6 20 33 39 51.4 2500 47 19310 18.0 244.5 E 441 7.6 2070 224.8 59 249.2 25 60 33 39 14.6 14.0 70 1730 22.6 25.7 E 678 11.8 1730 255.7 26.8 258.7 36 139 14.6 14.0 70 1730 22.5 25.0 E 17.2 1090 255.7 26.8 258.7 36 139 14.6 14.6 14.0 70 1730 22.5 25.0 E 17.2 1090 255.7 26.8 258.7 36 138 258.7 28 28 28 28 28 28 28 2	SITER	ATING	(3)	STREAM	WATER	ROUALI	TY (B)	100-YI		SPWY E	DESIGN	STORP	RUND	н	8.20 I	B	FLOW =	- 1	CFS
0 0.0 0 0.0 0 0.0 0 0.0 0.0 0.0 0.0 0.0												*						*	
100 1.7 7830 29 27300 12.6 * 239.1 E 193 3.4 4050 * 241.5 46 * 243.6 20 33 33 30 14.6 296.7 70 17300 12.0 * 246.5 E 678 11.8 1530 * 250.7 70 * 253.3 29 86 * 893.0 14.6 1470 70 17300 2.0 * 256.9 E 1024.1 7.0 1730 * 255.7 86 * 286.7 70 * 253.3 29 86 * 893.0 14.6 130 70 1730 2.0 * 255.0 E 1122 20.2 1090 * 255.7 86 * 286.7 76 * 253.3 29 86 * 893.0 14.6 130 76 12630 28.5 * 255.0 E 1122 20.2 1090 * 255.7 86 * 286.7 76 129.9 86 * 893.0 14.6 130 76 12630 28.5 * 255.0 E 1122 20.2 1090 * 256.9 9 1 * 259.7 76 136.9 136.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12	230.5	0	0.0		4		6.5	* 240				3320 #	245		*			*	** :
309 5-4 2950 47 19310 18:0 2 24.5 E 441 7.6 2070 2 24.6 1 5 5 25.3 29 86 86 89 1 2000 57 18110 22.0 * 249.5 E 441 7.6 2070 2 24.7 86 2 253.3 29 86 89 1 1 2 2000 57 18110 2 2.0 * 249.5 E 1024.17.9 1190 * 255.7 86 * 258.9 35 129 86 89 1 1 2 2000 57 18110 2 24.9 2 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	236.6	100	1.7	7830	53	27300	12.6	* 239				40204	241.		*			101	.21
917 9-1 200 57 18110 22.0 26.5 E 678 11.8 1530 255.7 70 8 255.3 29 86 86 890 14.6 1470 70 17350 26.9 E 255.3 E 1024 11.9 1190 E 255.7 86 8 258.3 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 129 8 5.8 16 120 120 12.8 16.8 12.8 12.8 12.8 12.8 12.8 12.8 12.8 12	242.0	309	5.4	2950	47	19310	18.0	* 244		- 1	-	2070 #	246		*			*	-43
830 14.6 1470 70 17350 26.59 253.3E 1024 17.9 1190 255.9 91 255.9 91 255.7 36 136 80.8 136 16.50 16.50 20.5 1152 20.2 1908 255.9 91 255.7 36 136 136 136 136 136 136 136 136 136	246.0	211	9.1	2000	57	18110	22.0	* 248	ш			1530 4	250.		*			*	• 58
943 16,5 1330 76 16630 28.5 * 255.0 E 1152 20.2 1090 * 256.9 91 * 259.7 36 136 * 36	250.8	830	14.6	1470	70	17350	26.9	* 253.	w	1024 1		1190	255		*			*	.72
RATING (3) DA= 1.77 SQ MI = 1133 AC USGS QUAD— CLINTON MASS RATING (3) DA= 1.77 SQ MI = 1133 AC USGS QUAD— CLINTON MASS 10 0.0 0.1 11 2530 44 5720 6.0 8 226.5 E 294 2.7 1000 8 229.0 90 8 231.0 13 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	252.5	943	16.5	1330	16	16630	28.5	* 255.			3.2	1090 #	256.		*			*	.75
DA= 1,77 Sq MI = 1133 AC USGS QUAD-CLINTON MASS LATITUDE 42-29-38 LONGITUDE		*****	*****	*******	*****	******	******	* *	*****	******	*****	*****	*****	非非非非非	*****	*****	*****	*****	* * * * =
RAIING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNDFF = 8.20 IN, PEAK FLOM = 10 0.0 0.0 0.0 1.1 2530 44 5720 6.0 * 226.5 E 254 2.7 1000 * 229.0 90 * 231.0 13 6.8 11.0 17 4840 9.6 * 230.6 E 254 2.7 1000 * 229.0 90 * 231.0 13 6.8 13.8 16 10.0 15.1 2537 5.6 910 132 4220 14.5 * 232.6 E 1207 12.8 460 * 236.7 187 * 234.7 22 17 11.8 12.9 1.0 13.2 4220 14.5 * 235.0 E 1207 12.8 460 * 236.7 187 * 239.7 22 17 11.0 17 480 132 4220 14.5 * 235.0 E 1207 12.8 460 * 236.7 187 * 239.7 22 17 11.0 17 480 13.2 4220 14.5 * 235.0 E 1207 12.8 460 * 236.7 187 * 239.7 22 17 11.0 12.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1	VA-0714				7 50 1		133 AC	USG	SQUAD	- CLIN	TON MA	SS		LATITU	DE 42-	39-38	LONGITU	DE 71-	38-01
0 0.0 0.0 0.1 1 2530 44 5720 6.0 * 226.5 E 254 2.7 1000 * 229.0 90 * 231.0 13 6 8 8 100 1.1 2530 44 5720 6.0 * 226.5 E 254 2.7 1000 * 229.0 90 * 231.0 13 6 8 8 100 1.1 2530 44 5720 6.0 * 226.5 E 254 2.7 1000 * 232.5 132 * 234.8 17 11 8 11 8 8 1 8 2.0 8 1 8 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	SITE R	ATING	(3)	STREAM	WATER	2 QUALI	TY (B)	100-Y	PRIN	SPWY (DESIGN	STOR		11	8.20 II	1. PEAK	FLOW =		CES
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NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-8, Catacoonamug Brook

The Catacoonamug Brook Subwatershed covers about 13,400 acres in Lancaster, Leominster, and Lunenburg, in Worcester County and Shirley, in Middlesex County.

Catacoonamug Brook is the major stream in the subwatershed, originating in Lunenburg and flowing southeasterly through Shirley to its confluence with the Nashua River. Elevations range from a high of about 680 feet on Clarks' Hill to about 250 feet in Shirley. Geology in the Catacoonamug Brook subwatershed is predominantly characterized by schist bedrock at depths of 15 to 60 feet overlain by glacial till, englacial drift or outwash sand and gravel.

Twenty potential reservoir sites and four existing reservoirs were studied. Design summaries are included for 11 potential sites that met study criteria.

SITE NA-0801

Location:

On a tributary to Catacoonamug Brook approximately 3,200 feet upstream from Page Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35°25" Longitude: 71°42°22"

Facilities Affected:

This site was eliminated from further study because of low storage potential and high cost to relocate affected facilities.

Geologic Conditions:

Both abutments are silty sand (glacial till) at higher elevations and sand and gravel terrace at lower elevations. There is a schist outcrop high on the left abutment. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 per cent. Waterholding capabilities appear fair to good.

SITE NA-0801 (cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Water-holding capabilities appear fair to good depending upon whether a cut-off is made through the swamp_deposits in the foundation and sand and gravel terraces on both abutments.

SITE NA-0802

Location:

On a tributary to Catacoonamug Brook approximately 1,350 feet down stream from Page Street in Lunenburg, Massachusetts.

Snirley, Massachusetts Quadrangle

Latitude: 42°34'46" Longitude: 71°42'11"

Facilities Affected:

This site was eliminated from further study because of low storage potential, high cost of affected facilities, and poor water holding capability.

Geologic Conditions:

The right abutment is glacial outwash with swamp at the lower elevations. The left abutment is englacial drift at higher elevations and poorly graded outwash sand and gravel at lower elevations—shallow to bedrock. Depth to schist bedrock in the foundation is not known but may be 50 to 60 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment. Water-holding capabilities appear poor due to the outwash plain on the right abutment.

Abutments for dikes consist of englacial drift.

Location:

On Catacoonamug Brook approximately 1500 feet upstream from Lancaster Avenue in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°34'21" Longitude: 71°43'10"

Facilities Affected:

No facilities affected below elevation 410 feet.

Geologic Conditions:

Both abutments are silty sand glacial till with poorly graded sand terrace and swamps at lower elevations. Depth to schist bedrock in the foundation is not known but may be 45 to 55 feet. There are leakage problems in the foundation and low on both abutments. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be fair to good depending upon whether or not positive cutoff is made beneath the sand terraces and swamp.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0804

Location:

At outlet end of marsh draining into Massapoag Pond approximately 3000 feet upstream of Massapoag Pond in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°33'51" Longitude: 71°43'34"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (213 acres). Therefore, no further investigations were made.

Location:

On a tributary to Massapoag Pond approximately 200 feet upstream from Lincoln Street in Leominster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°33'42" Longitude: 71°44'11"

Facilities Affected:

Below Elevation 460 41 houses 3 sheds 2 garages 780 feet of North Street 450 feet of Lincoln Street

Geologic
Conditions:

The left abutment is silty sand (glacial till). The right abutment is poorly graded sand and gravel outwash. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There is a leakage problem on the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear fair to poor due to outwash on the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 5% of the site is owned by the Town of Leominster.

SITE NA-0806 -- MASSAPOAG POND

Location:

Upstream of Lancaster Avenue in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Surface Area (Acres)	
55	

Height (Ft	of t.)	Dam
	3	

Drainage	Area	
(Acres)	(Sq.	<u>Mi.</u>)
1600	2.1	19

Potential for

Expansion:

Appears to have fair potential-Surface area could be more than doubled with little effect on facilities.

Remarks:

This is an earth dam. Spillway structure has been removed. Flows pass through the breach on left abutment. Dam has many trees growing on the fill.

Geologic Conditions:

Both abutments are silty sand glacial till. There is swamp low on the right abutment and poorly graded sand and gravel low on the toe of the right abutment. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a leakage problem on the right of the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear to be good provided a cutoff is made to glacial till beneath the swmap low on the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On a tributary to Catacoonamug Brook approximately 350 feet upstream from Goodrich Street in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°33'33" Longitude: 71°42'39"

Facilities Affected:

Below Elevation 370

725 feet of Lancaster Avenue

Below Elevation 365

590 feet of Lancaster Avenue

Below Elevation 360

400 feet of Lancaster Avenue

Geologic Conditions:

Both abutments are silty (glacial till) with stream terrace deposits and swamp at low elevations. Depth to schist bedrock in the foundation is not known, but may be 20 to 30 feet. There are leakage problems low on both abutments and in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear fair to good depending upon whether a cutoff is made to glacial till beneath the stream terrace and the swamp low on the abutments and in the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

On Catacoonamug Brook approximately 600 feet downstream from Reservoir Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°34'02" Longitude: 71°41'50"

Facilities Affected:

Below Elevation 340 1550 feet of Lancaster Avenue 4200 feet of Reservoir Road

Below Elevation 330 1200 feet of Lancaster Avenue 4200 feet of Reservoir Road

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor. Foundations of dikes are good, although the abutments probably will leak.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

At outlet end of a long swamp approximately 1,100 feet upstream from Catacoonamug Road in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°33'26" Longitude: 71°40'24"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (125 acres). Therefore, no further investigations were made.

Location:

On Spruce Swamp Brook approximately 3,500 feet upstream from Boston and Maine Railroad in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°33'18" Longitude: 71°39'56"

Facilities Affected:

Below Elevation 330

1 house 1 barn

300 feet of Holden Road

Geologic Conditions:

The left abutment is outwash sand and gravel with schist outcrops high on the left abutment. The right abutment is outwash sand and gravel. Depth to schist bedrock is not known but may be 15 to 20 feet. There are leakage problems in both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor; however, schist bedrock on the left abutment may be relatively shallow and although no outcrops were observed in the right abutment, there is a possibility of bedrock.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0811

Location:

On Easter Brook approximately 800 feet upstream from Gibson Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°32'43" Longitude: 71°42'56"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (269 acres). Therefore, no further investigations were made.

Location:

On Easter Brook approximately 400 feet upstream from Goodrich Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°33'04"

Longitude: 71⁰42'00"

Facilities Affected:

Below Elevation 360
2900 feet of pipeline
2 houses

Below Elevation 345
2500 feet of pipeline
1 house

Below Elevation 350
2900 feet of pipeline

Below Elevation 330
1200 feet of pipeline

1 house

Geologic Conditions:

The right abutment is outwash sand and gravel.
The left abutment is glacial till. Depth
to bedrock in the foundation is not known.
There are leakage problems in the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0813

Location:

At outlet end of marsh draining into Oak Hill Pond. Approximately 400 feet upstream of pond in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°30'19" Longitude: 71°40'26"

SITE NA-0813 (Contid)

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (179 acres). Therefore, no further investigations were made.

SITE NA-0815

Location:

On McGovern Brook approximately 7,000 feet upstream from the North Nashua River in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°30'54" Longitude: 71°41'58"

Facilities Affected:

No facilities affected below elevation 390.

Geologic Conditions:

The right abutment is outwash sand and gravel and the left abutment is glacial till. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in the right abutment and possibly in the foundation. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear to be poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0816

Location:

On Bow Brook near the intersection of Shirley, Lancaster, and Lunenburg Boundaries in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°31'51" Longitude: 71°40'34"

SITE NA-0816 (Cont'd)

Facilities Affected:

Below Elevation 350

Below Elevation 345

21 houses

6 houses

375 feet of gravel road

375 feet of gravel road

Below Elevation 340

2 houses

250 feet of gravel road

Geologic Conditions:

The right abutment is ice contact sand and gravel outwash. The left abutment is outwash sand and gravel and kame terrace. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

Recommended location for an emergency spillway is at the right abutment.

SITE NA-0817

Location:

On a tributary to Bow Brook approximately 1,900 feet downstream from Lancaster Road in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°31'50" Longitude: 71°40'20"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (275 acres). Therefore no further investigations were made.

Location:

On Spectacle Brook approximately 600 feet upstream from Lunenburg Road in Lancaster, Massachusetts on Fort Devens Military Reservation.

Clinton, Massachusetts Quadrangle

Latitude: 42°29'39" Longitude: 71°41'06"

Facilities Affected:

3,000 feet of an un-named road.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash with swamp at low elevations. Depth to phylitte bedrock in the foundation is not known but may be 25 to 30 feet. There are leakage problems in both abutments and in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor due to outwash sand and gravel on both abutments.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

The entire site is owned by the U.S. Army.

SITE NA-0819

Location:

On Catacoonamug Brook approximately 400 feet upstream from Flat Hill Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°33'59" Longitude: 71°41'32"

Facilities Affected:

Below Elevation 340 Below Elevation 330

1 house Sportsman's Club 1550 feet of Lancaster Avenue 1200 feet of Lancaster Ave.

1850 feet of Flat Hill 1850 feet of Flat Hill

Road Road

4150 feet of Reservoir Road 4150 feet of Reservoir Road Sportsman's Club

SITE NA-0819 (cont'd)

Geologic Conditions:

The left abutment is sand and gravel esker deposits. The right abutment is outwash sand and gravel. Depth to bedrock in the foundation is not known. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 5 % of the site is owned by the Town of Lunenburg.

SITE NA-0820 -- LAKE SHIRLEY

Location:

On the Worcester County-Middlesex County line in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	e Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
()			-)
354	25	9200	14.37

Potential for

Expansion:

Further expansion would affect a large number of cottages and the Boston and Maine Railroad.

Remarks:

This is an earth-fill dam with a concrete retaining wall at the upstream slope. Spillway is a 25 foot weir with a stepchute outlet of granite block construction. Overall conditions of the structure is good.

SITE NA-0821 -- FORT POND

Location:

On Bow Brook, downstream of Lunenburg Road in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle.

Surface Area	
(Acres)	

Height of Dam (Ft.)

Drainage Area
(Acres) (Sq. Mi.)

74

6

510 0.80

Potential

for

Expansion:

Limited by numerous cottages located

around the pond.

Remarks:

The spillway is a 4 foot wide, 4 foot deep concrete weir. The structure is in poor conditions. Spillway concrete

has many cracks.

Location:

On a tributary to Catacoonamug Brook approximately 100 feet upstream from West Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35'24" Longitude: 71°44'06"

Facilities Affected:

Below Elevation 500
21 houses

Below Elevation 480
4 houses

Below Elevation 490
13 houses

Below Elevation 470
2 houses

Geologic Conditions:

Both abutments are glacial till with about 20 percent boulders. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a leakage problem in the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6-inches may run to 20 percent. Waterholding capabilities appear good if a positive cutoff can be made to glacial till in the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0823 -- LAKE WHALOM

Location:

Near Prospect Street in Lunenburg,

Massachusetts.

Shirley, Massachusetts Quadrangle.

Surface Area
(Acres)

Height of Dam (Ft.)

5

Drainage	Ar	ea
(Acres)	(Sq.	Mi.)

0.7

450

94

Potential

for

Expansion:

Limited by cottages, amusement park, and

small drainage area.

Remarks:

This is a low earth dam with a 3 foot wide open spillway and an auxiliary chute spillway. There are trees growing on the fill and the concrete spillways are cracked in many places. Overall condition of the

structure is poor.



SITE NA-0824 Spectacle Pond

Location:

On Spectacle Brook between Shirley Road and Lunenburg Road in Lancaster, Massachusetts.

Shirley, Massachusetts Quadrangle

Remarks:

Spectacle Pond appears to be a natural depression with no dam. Control is a stone structure with a culvert under road. No photos were taken.

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A AND COST DATA. D ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. E, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE TION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. TO SHOM-VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO	A AND COST DATA. D ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. E, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE TION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. TO SHOW-VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO	362.5		4.8	520	270	4290	26.5	36	5.0	2932	7.6				*	1.69	34		
- (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE— C*CONCRETE CHUTE, D*CONCRETE DROP, E*EXCAVATED, T* TWO SPILLWAYS, N* NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. (5) ELEVATIONS ARE SHOWN TO THE NEAREST O.1 FOOT TO SHOW-VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO	- (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE— C*CONCRETE CHUTE, D*CONCRETE DROP, E*EXCAVATED, T** TWO SPILLWAYS, N** NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. (5) ELEVATIONS ARE SHOWN TO THE NEAREST O.1 FOOT TO SHOW-VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO	******	******	*****	******	*****	******	*****	*****	М	******	*****	*****	******	*****	****	*****	*****	*****	******
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## AREA SUFF ## CREST ## CREST ## FER ## LEV ## AREA ## CREST ## C	STORAGE PER REA SUR CREAT CAST	CALCIONE COST COS	STRANGE COST	**************************************	######################################	######################################	**************************************	GH MATER ******* LEV AREA LATITUD UNOFF = 8 30.2 286 34.0 345 34.0 340 34.0	######################################	######################################	* YIELD ***** YIELD ILL *PERCENT DL *CHANCE 1000 * (MGD) ************************************
STORAGE COST	STORAGE PER AREA SUFF T ELEY AT CREST COST CO	STORAGE COST	STORAGE REA ALC	**************************************	REST LEV TYPE MSL) NSL) NSL) 128.0 328.0 331.7 336.7 336.7 350.9 350.9 351.0 3	######################################	ST * * * * * * * * * * * * * * * * * * *	LEV AREA SL) (AC) ******** LATITUD UNOFF = 8 30.2 286 34.0 345 34.0 345 34.0 345 36.2 429 46.2 469 52.7 638 53.6 682 46.2 469 60.1 100 UNOFF = 8	TOP ELEV (MSL) ******** 242-34-0 10 IN, Pl 342-7 342-7 342-7 345-1 351-4 351-4 351-4 356-7	HGT VC FT FT EAK FLONG 39 41 47 54 64 54 64 54 64 64 64 64 64 64 64 64 64 64 64 64 64	LLL *PERCENT 3L *CHANCE 1000 * CY) * (MGD) CY) * (MGD) ************************************
### AREA SURF AT ALL AT RELEV AT CREST PER ELEV AREA ELEV HAGE FER AREA ELEV HAGE AGE FER AREA ELEV HAGE AGE FER AREA ELEV HAGE AGE AGE AGE AGE AGE AGE AGE AGE AGE	STORAGE FER AREA SUKF AI SELEV AI CREST FER FER AREA ELEV HAS	STORAGE FER AREA SUKF AT ELEV AT CREST FER AE F FER AREA ELEV AE F	STORAGE PER AREA SURF AT SELEV AT CREST PER PER RELEV AREA SURF AT CRIST AC	V STORAGE PER AREA SURF. L) AC FT IN (\$) (AC) (\$) ***********************************	MSL) MSL) ***** USGS 0-YR 336.7 343.7 343.7 350.9 351.2 351.2 351.2 351.2 351.2	T CREST PE FT IN (************************************	FT * E \$ 1 * (M \$ 1 * (M	LEV AREA SL) (AC) ******** LATITUD UNOFF = 8 30.2 286 34.0 345 34.0 345 39.2 429 46.2 469 52.7 638 53.6 682 ********* LATITUD UNOFF = 8	(MSL) ************************************	HGT VC FT LONG 36 39 41 47 53 53 LONG EAK FLOV	1000 ** CHANCE CY) * (MGD) ************************************
AC FT IN (3) (AC) (4) (AC) (AC) (AC) (AC) (AC) (AC) (AC) (AC	AC FT IN (3) (AC) (4) (FIT) ** (HIL) AC FT IN (4) (FIT) (AC) ** (HSL) (A	AC FT IN (15) (AC) (15) (FAT) *** (MSL) AC FT IN (15) *** (MSL) (AC) *** (MSL) FERSONS***********************************	AC FT IN (\$1) (AC) (\$1) (AC) (\$1) (AC) (\$2) (AC) (AC) (AC) (AC) (AC) (AC) (AC) (AC	L) AC FT IN (\$) (AC) (\$) ***********************************	MACA MACA	FT IN AL SHEET IN E STAN DESIGN B & B STAN DESIGN B & B STAN B & B	\$5	SL) (AC) ******** UNOFF = 8 30.2 286 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 34.0 345 44.0	(MSL) = 42-34-0 = 42-34-0 = 340-0 = 342-7 = 345-1 = 351-4 = 351-4 = 351-4 = 356-7 = 42-33-1 = 10 IN, P!	FT ************************************	CY) * (MGD) ************************************
RATING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (3) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (1) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (1) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (1) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (1) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (1) STREAM WATER QUALITY (8), 100-YR DRIN SPAN DESIGN STORM RUNDEF = 8.10 L14. PER RAING (1) STREAM WATER COULCE COUNCER ENGINE STORM STORM RUNDEF = 8.10 L14. PER RAING (2) STORM STORM RUNDEF STORM STORM STORM RUNDEF STORM	171 2.7 3060 184 19520 17.2 331.7 5 584 12.9 8 34.0 345.8 345.0 345.9 345.1	A	RATING (3) STREAM WATER QUALITY (8), 100—YR PRIN SPHYREY MASS A. 2000 184 19520 17.2 * 331.7 E 376 8.8 950 * 334.0 345 * 345.1 C 552 8 15.1 E 590 430 930 930 930 930.2 E 540.0 E 52.5 410 100 286 12890 2.6.2 * 330.7 E 564.12.8 660 * 339.2 4.29 * 345.1 C 552 8 15.1 590 430 930 35.3 * 340.7 E 5604 13.9 450 * 340.2 459 * 351.4 E 564.12.8 560 13.0 * 346.2 469 * 351.4 E 562.1 E 554.12.8 560 13.0 * 346.2 469 * 351.4 E 562.1 E 564.12.8 560 13.0 * 346.2 469 * 351.4 E 562.1 E 564.1 E 560 13.0 * 346.2 469 * 351.4 E 560.1	808 TE RATING (3) STREAM WATER QUALITY 1 0 0.0 2 2 1171 2.7 3060 184 19520 2 3314 7.6 1110 286 12890 2 6528 15.1 590 430 9030 4 9742 22.5 410 470 8530 7 10813 25.0 370 481 8390 ***********************************	00-YR 00-YR 338-0 338-7 338-7 350-9 351-2 351-2 00-YR	**************************************	SS STORM Re 3 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 0 * 3 3 3 3	LATITUD UNDEF = 8 30.2 286 34.0 345 39.2 429 46.0 345 52.7 638 53.6 682 LATITUD UNDEF = 8	340.0 340.0 342.7 345.1 342.7 345.1 351.4 356.7 356.7	36 39 41 47 53 53 1006 EAK FLON	110E 71-41-8 110E 71-41-8 49 * * * * * * * * * * * * * * * * * * *
Date Date Bill SQ Mi = 5190 AC USGS QUAD SHIRLEY MASS LATITUDE 42-34-02	Da= 8.11 SQ MI = 5190 AC USGS QUAD—SHIRLEY MASS LATITUDE 42-34-02	Da= 0.11 SQ MI = 5190 AC	ARTING (3) DA= 8-11 SQ MI = 5190 AC USGS QUAD- SHIRLEY MASS RATING (3) STREAM WATER QUALITY (6) 100-YR PRIN SPHY DESIGN STORM RUNDEF = 8.10 IN-DEA	STREAM WATER QUALITY STREAM WATER QUALITY	USGS 00-YR 331-7 343-7 350-9 350-9 10-YR	SPWY DESIGN 2740 6.3 1 3786 8.8 5584 12.8 8604 19.9 2036 27.7 2182 28.2 ***********************************	STORM R(250 * 3 950 * 3 330 * 3 330 * 3 300 *	LATITUD UNOFF = 8 30.2 286 34.0 345 39.2 429 46.2 469 52.7 638 53.6 682 ************************************	340.0 340.0 342.7 342.7 345.1 351.4 351.4 356.7 888888888888888888888888888888888888	2 LONG 36 39 41 47 54 53 53 LONG 28	17UDE 71-41-5 49 * ***** 49 * ***** 58 * 2.19 66 * 4.02 94 * 5.57 131 * 6.52 124 * 6.75 ************************************
1171 2.7 3060 184 19520 17.2 331.7 E 3786 8.8 950 334.0 345 342.7 39 58 8381 7.6 3110 2.7 3060 184 19520 17.2 331.7 E 378 8.8 8.8 950 334.0 345.5 345.7 39 58 8381 7.6 3110 25.2 340.7 26 2890 26.2 334.7 E 584 12.8 6.0 334.2 4.9 351.4 47 94 94 94 94 94 94 9	0 0.0 0.0 0.0 22 6.1 * 328.0 E 2740 6.3 1250 * 330.2 1171 2.7 3060 184 19520 17.2 * 331.7 E 378.6 8.8 950 * 334.0 2314 7.6 1110 286 12890 26.2 * 336.7 E 5584 12.8 650 * 330.2 6528 15.1 590 430 9330 35.3 * 343.7 E 86.04 19.9 450 * 330.2 56.2 * 330.7 E 120.2 8.2 5 410 470 8530 42.7 * 351.2 E 12182 28.2 330 * 352.7 10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 330 * 352.7 10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 1 330 * 353.6 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 1 20.2 8.2 8.2 8.2 8.2 8.2 8.2 8.2 8.2 8.2 8	0 0.0 0 0.0 184 19520 11.2 8 331.7 E 3786 8.8 950 8 334.0 286 8 340.0 36 49 8 1331 4 7.6 110 286 12890 26.2 8 336.7 E 5584 12.8 660 8 334.0 345 8 345.7 39 58 8 9334 7.6 110 286 12890 26.2 8 336.7 E 5584 12.8 660 8 334.2 429 351.4 41 66 8 974 22.5 410 470 8390 4.2 8 350.9 E 12036 21.7 330 8 355.6 682 8 357.9 54 131 8 10813 25.0 401 370 461 8 350 44.7 8 351.2 E 12182 25.2 330 8 355.6 682 8 357.9 54 131 8 10813 25.0 37 38 HI = 621 8 62 10.9 8 351.4 47 94 8 36 10 470 8390 4.4 8 350.9 E 12036 21.7 330 8 355.6 682 8 357.9 54 131 8 10813 25.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	0 0.0 0 22 0.1 0.2 0.2 0.1 0.2 0.2 0.2 0.3 0.2 0.2 0.3 0.2 0.2 0.3 0.4 0.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	-1 0 0.0 22 -2 1171 2.7 3060 184 19520 -2 3314 7.6 1110 286 12890 -2 6528 15.1 590 430 9030 -4 9742 22.5 410 470 8530 -7 10813 25.0 370 481 8390 -************************************	328.0 331.7 336.7 336.7 350.9 351.2 100.4 100.4	2740 6.3 1 3786 8.8 5584 12.8 8604 19.9 2036 27.7 2182 28.2 ***********************************		286 345 4429 469 469 682 682 682 682 682 682 682 682 682 682	340.0 342.7 345.1 351.4 351.9 356.7 ******	36 39 41 47 54 53 1006 EAK FLOV	49 ** 58 * 58 * 94 * 94 * 131 * 1124 **
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3314 7.6 1110 286 12890 26.2 \$ 345.7 E 5584 12.8 660 \$ 339.2 429 \$ 345.1 41 66 \$ 9528 15.1 590 430 933 35.3 \$ 343.7 E 8604 19.9 450 \$ 346.7 E 8604 19.9 450 \$ 345.7 E 875.7 E	3314 7.6 1110 286 12890 26.2 * 336.7 E 5584 12.8 660 * 339.2 6528 15.1 590 430 953.3 * 343.7 E 8604 19.9 450 * 346.2 574.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 30 * 352.7 10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 330 * 353.6 * 410.6 12.9 0.9	3314 7.6 1110 286 12890 26.2 * 336.7 E 5584 12.8 660 * 339.2 429 * 355.1 47 94 * 6528 155.1 570 430 935.3 4 24.4 * 350.9 E 12036 27.7 330 * 352.7 638 * 357.4 54 131 4	3314 7.6 1110 286 12890 35-3 345.7 E 5584 12.8 660 * 339.2 429 * 355.1 47 94 * 95 65 8 95 65 8 95 65 8 95 8 95 10 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	-2 3314 7.6 1110 286 12890 -2 6528 15.1 590 430 9030 -4 9742 22.5 410 470 8530 -7 10813 25.0 370 481 8390 ************************************		5584 12.8 8604 19.9 2036 27.7 2182 28.2 ***********************************		39.2 429 46.2 469 52.7 638 53.6 682 ************************************	355.1 351.4 357.9 356.7 ************************************	41 47 54 53 ****** EAK FLOV	* * * * * * * *
6528 15.1 590 430 9030 35.3 4 34.3 E 12036 27.5 330 430.6 45.2 59 451.4 47 94 48 48 48 48 48 48 48	6528 15.1 590 430 9030 35.3 + 343.7 E 8604 19.9 450 + 346.2 9742 22.5 410 470 8530 42.4 + 350.9 E 12036 27.7 330 + 353.6 10813 25.0 370 411 830 44.7 835.7 1081 25.0 370 411 830 44.3 44.3 44.3 44.3 1086 21.0 2.9 8630 2.4 4.3 4.3 4.3 8.2 2.8 2.8 2.8 1086 21.0 2.9 8630 3.0 4.3 4.3 8.0 2.8 2.8 2.8 1086 21.0 350 31.6 4.3 4.3 4.3 4.3 8.2 2.8 5.9 8.3 4.3 1086 21.0 350 4.5 4.3 8.3 3.0 2.8 2.8 5.9 8.3 3.0 1086 21.0 350 4.5 8.3 4.5 8.8 5.9 8.3 8.2 5.8 1086 21.0 350 4.5 8.3 8.3 8.2 5.8 5.9 8.3 8.3 1086 21.0 350 4.5 8.3 8.3 8.2 5.8 5.9 8.3 8.3 1086 21.0 350 4.5 8.3 8.3 8.2 5.8 5.9 8.3 8.3 1086 21.0 3.5 8.3 4.5 8.3 8.3 8.3 8.3 8.3 8.3 8.3 8.3 1097 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 3.1 109 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 ***********************************	6528 15.1 590 430 9030 35.3 4.3 71.2 E 12036 27.2 330 436.2 469 451.4 47 94 481	10 1.5	-2 6528 15.1 590 430 9030 -4 9742 22.5 410 470 8530 -7 10813 25.0 370 481 8390 ************************************		8604 19.9 2036 27.7 2182 28.2 *************** - SHIRLEY MAS SPWY DESIGN 215 4.1 3		46.2 469 52.7 638 53.6 682 ************************************	351.4 357.9 356.7 ******* E 42-33-1	47 54 53 ******* 8 LONGI EAK FLOY	* * * * *
9742 22.5 410 470 8530 42.4 * 350.9 E 12036 27.7 330 * 352.7 638 * 357.9 54 131 * 124 * 10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 330 * 353.6 682 * 356.7 53 8818124 * 8818182 88181882 88181882 88181882 88181882 88181882 88181882 88181882 88181882 881818888 88181882 88181882 88181882 88181882 88181882 88181882 8818188888 88181888888 881818888 88181888 8818188888 881818888 881818888 88181888 88181888 88181888 88181888 881818888 881818888 881818888 881818888 881818888 881818888 881818888 881818888 88181888888	9742 22.5 410 470 8530 42.4 * 350.9 E 12036 27.7 330 * 352.7 1081 25.0 370 481 8390 44.7 * 351.2 E 1218 28.2 330 * 352.6 * 333.6 * 353	9742 22.5 410 470 8530 42.4 * 350.9 E 12036 27.7 330 * 352.7 638 * 357.9 54 131 * 10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 330 * 353.7 638 * 355.7 53 81.24 * 8.8888888888888888888888888888888888	9742 22.5 410 470 6530 42.4 * 350.9 E 12036 27.7 330 * 352.7 638 * 357.9 54 131 * 818.8 81	*4 9742 22.5 410 470 8530 *7 10813 25.0 370 481 8390 ************************************		2036 27.7 2182 28.2 **************** - SHIRLEY MAS SPWY DESIGN		52.7 638 53.6 682 ************************************	# 356.7 ######## E 42-33-1	54 53 1006 EAK_FLOV	* * * * 1
10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 330 * 353.6 682 * 356.7 53 124 * 800000000000000000000000000000000000	10813 25.0 370 481 8390 44.7 * 351.2 E 12182 28.2 330 * 353.6	10813 25 0 370 481 8390 44.7 4 351.2 E 12182 28.2 330 4 353.6 682 4 356.7 53 124	10813 25,0 370 481 8390 44,7 8351,2 E 12182 28,2 330 835,6 682 836,7 53 124	**************************************		2182 28.2 *************** - SHIRLEY MAS SPWY DESIGN 215 4.1 3	*	EATITUD LATITUD UNDEF = 8	# 356.7 ######## E 42-33-10	53 LONGI EAK FLOV	* * * 1
RATING (3) DA= 0.97 SQ MI = 621 AC USGS QUAD- SHIRLEY MASS RATING (3) DA= 0.97 SQ MI = 621 AC USGS QUAD- SHIRLEY MASS 0 0.0 0.0 3 4.3 * 301.7 E 215 4.1 3890 * 304.1 26 * 306.4 28 2 2 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	ATTING (3) STREAM MATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNDFF (B) STREAM MATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNDFF (B) STREAM MATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNDFF (B) 300 31 32670 28.7 # 309.2 E 423 8.2 2360 # 310.6 5 300 31 32670 28.7 # 309.2 E 423 8.2 2360 # 310.6 5 30.6 5 300 37.5 # 318.1 E 822 15.8 1500 # 320.4 1086 21.0 1350 69 21330 44.5 # 325.0 E 1277 24.7 1150 # 327.0 HASS (B) 13.2 TREAM MATER QUALITY (B) 100-YR PRIN SPHY DESIGN STORM RUNDFF (B) 100 0.7 17730 50 35730 4.6 # 331.2 E 606 4.1 2910 # 333.6 811 5.5 2340 1160 28.2 # 332.7 E 606 4.1 2910 # 333.6 811 5.5 2340 1160 28.2 # 332.7 E 606 4.1 2910 # 333.6 811 5.5 2340 1160 28.2 # 325.7 E 383.6 5.2 570 # 333.6 811 5.5 2340 10480 30.0 # 354.7 E 2318 15.8 800 # 347.2 818.7 REMBERSENCY SPILLMAY STORAGE AND COST DATA.	RATING (3) DA= 0.97 SQ MI = 621 AC USGS QUAD- SHIRLEY MASS RATING (3) DA= 0.97 SQ MI = 621 AC USGS QUAD- SHIRLEY MASS RATING (3) DA= 0.97 SQ MI = 621 AC USGS QUAD- SHIRLEY MASS RATING (3) DA= 0.97 SQ MI = 63410 17.7 * 298.2 E 145 2.8 5940 * 300.5 19 * 302.0 24 13 * 34 6.5 3000 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 45 * 1080 1.9 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 61 * 322.6 45 117 * 1080 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.	Action A	######################################		**************************************	*	LATITUD LATITUD UNGFF = 8 04.1 26	E 42-33-1	****** B LONGI EAK FLOV	* *
10	0 0.0 3 4.3 * 301.7 E 215 4.1 3890 * 304.1 100	National Color	100 1.9 8630 14 63410 17.7 298.2 24.1 3890 304.1 26 306.4 28 20 8 304.5 38.3 30.5 38.2 3		* 301.7	215 4-1 3		26	N. O.	AK FLUY	= 295
0 0.0 0 3 4.3 ** 301.7 E 215 4.1 3890 ** 304.1 26 ** 306.4 28 20 ** 310.0 1.9 8630 14 63410 17.7 ** 298.2 E 145 2.8 5940 ** 300.5 19 ** 302.0 24 13 ** 334 6.5 3000 31 32670 28.7 ** 300.2 E 423 8.2 2360 ** 311.6 40 ** 313.2 35 45 ** 685 13.2 1800 49 25100 37.5 ** 318.1 E 822 15.8 1500 ** 327.0 87 ** 328.9 52 201 ** 328.9 52 201 ** 328.9 52 201	100 1.9 8630 14 63410 17.7 # 298.2 E 145 2.8 5940 # 300.5 334 6.5 3000 31 32670 28.7 # 309.2 E 423 8.2 2360 # 311.6 685 13.2 1800 49 25100 37.5 # 318.1 E 822 15.8 1500 # 320.4 1086 21.0 1350 69 21330 44.5 # 325.0 E 1277 24.7 1150 # 327.0 ***********************************	0 0.0 0 3 4.3 * 301.7 E 215 4.1 3890 * 304.1 26 * 306.4 28 20 * 31.0 1 3 * 302.0 24 13 * 34 6.5 3000 31 3.2670 28.7 * 303.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 45 * 45 * 45 * 45 * 3000 31 3.2670 28.7 * 303.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 45 * 45 * 45 * 45 * 45 * 45 * 4	0 0.0 0 1.9 8630 14 63410 17.7 * 298.2 E 145 2.8 5940 * 300.5 19 * 302.0 24 13 * 310.0 1.9 8630 14 63410 17.7 * 298.2 E 145 2.8 5940 * 300.5 19 * 302.0 24 13 * 310.0 13 32670 37.5 * 318.1 E 822 15.8 1500 * 327.0 87 * 329.9 52 201 * * * * * * * * * * * * * * * * * * *		* 301.7	4.1	* *			28	k s
100 1.9 8630 14 63410 17.7 * 298.2 E 145 2.8 5940 * 310.5 19 * 302.0 24 13 * 334 6.5 300 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 45 * 685 130.0 31.5 * 318.1 E 82.2 136.0 * 320.4 61 * 322.6 45 117 * 178.6 21.0 1350 69 25100 37.5 * 318.1 E 82.2 12.8 1500 * 327.0 4 61 * 329.9 52 201 * * * * * * * * * * * * * * * * * * *	100 1.9 8630 14 63410 17.7 * 298.2 E 145 2.8 5940 * 300.5 334 6.5 3000 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 LA 277.0 LA 27.0 LA 2.74 SQ MI = 1754 AC USGS QUAD-SHIRLEY MASS A TING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF TO 0.0 LOOP STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF TO 0.0 LOOP STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF TO 0.0 LOOP STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF TO 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF TO 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 335.1 STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF THE STORM	100 1.9 8630 14 63410 17.7 * 298.2 E 145 2.8 5940 * 310.5 19 * 302.0 24 13 * 8540 6.5 300 31 32670 28.7 * 309.2 E 423 8.2 2360 * 310.6 40 * 313.2 35 45 * 5 * 685 100 31.6 40 * 313.2 35 45 * 5 * 685 100 31.6 40 * 313.0 45 * 5 * 117 * 118 * 1	100 1.9 8630 14 63410 17.7 * 298.2 E 145 2.8 5940 * 300.5 19 * 302.0 24 13 * 65 45 45 45 45 45 45 45 13 46 6.5 3000 31 32670 28.7 * 308.2 E 423 8.2 2360 * 311.6 40 * 312.2 35 45 45 117 180 6 213.0 1350 6 9 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 6 17 * 322.6 45 117 18 18 18 18 18 18 18 18 18 18 18 18 18	0.0	. ,	2. B)	*
334 6.5 3000 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 61 * 322.6 45 117 * 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 87 * 329.9 52 201 * * * * * * * * * * * * * * * * * * *	334 6.5 3000 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 ***********************************	334 6.5 3000 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 6 8 1086 21.0 1350 49 25100 37.5 * 318.1 E 82 15.8 1500 * 320.4 61 * 322.6 45 117 * 8 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 61 * 329.9 52 201 * 8 * 8 * 8 * 8 * 8 * 8 * 8 * 8 * 8 *	334 6.5 3000 31 32670 28.7 * 309.2 E 423 8.2 2360 * 311.6 40 * 313.2 35 45 * 68 1685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 327.0 67 * 320.4 61 * 322.6 45 117 * 8 18.1 E 822 15.8 1500 * 327.0 67 * 329.6 45 117 * 8 18.1 E 822 15.8 1500 * 327.0 67 * 329.6 45 117 * 8 18.1 E 822 15.8 1500 * 327.0 67 * 329.6 45 117 * 8 18.1 E 822 15.8 1500 * 327.0 67 * 329.6 4 LONGITUDE 8	100 1.9 8630 14	* 298.2	0.7	*			24	*
685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 61 * 322.6 45 117 * 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 87 * 329.9 52 201 * * * * * * * * * * * * * * * * * * *	685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 ***********************************	685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 61 * 322.6 45 117 * 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 87 * 329.9 52 201 * * * * * * * * * * * * * * * * * * *	685 13.2 1800 49 25100 37.5 * 318.1 E 822 15.8 1500 * 320.4 61 * 322.6 45 117 * 1086 21.0 1350 69 21330 44.5 * 325.0 E 1277 24.7 1150 * 327.0 87 * 329.9 52 201 * **********************************	334 6.5 3000 31	* 309.2	8.2	*		* 313.2	35	*
######################################	######################################	######################################	######################################	685 13.2 1800 49	* 318°1	15.8	*			45	*
######################################	**************************************	######################################	**************************************	1086 21.0 1350 69	* 325.0	24.7	*			52	*
DA= 2.74 SQ MI = 1754 AC USGS QUAD- SHIRLEY MASS LATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = ** 0 0.0 1.7 * 332.7 E 606 4.1 2910 * 335.1 120 * 337.9 16 9 * 100 0.7 1730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.4 13 6 * 18 10 0.7 1730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 347.2 183 * 349.9 28 32 * 1877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 3298 22.6 660 196 11060 28.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 3653 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 355.5 241 * 359.0 37 62 * 365.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.0 37 64 * *********************************	DA= 2.74 SQ MI = 1754 AC USGS QUAD- SHIRLEY MASS RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF 0 0.0 19 1.7 * 332.7 E 606 4.1 2910 * 335.1 100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 1877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 3298 22.6 660 196 11060 28.2 * 355.7 E 3836 26.2 570 * 355.1 3653 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 ***********************************	DA= 2.74 SQ MI = 1754 AC	DA= 2.74 SQ MI = 1754 AC USGS QUAD- SHIRLEY MASS LATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = ** 0 0.0 1			****			***	***	***
RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW =	## ## ## ## ## ## ## ## ## ## ## ## ##	RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNOFF = 8.10 IN, PEAK FLOW = 827 C ****** 0 0.0 1.7 * 332.7 E 606 4.1 2910 * 335.1 120 * 337.9 16 9 * * * * * * * 100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.4 13 6 * 0.3 811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 341.6 20 14 * 1.1 1877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 1.7 3298 22.6 660 196 11060 28.2 * 352.7 E 338.2 6.2 2 3653 25.0 600 209 196 11060 28.2 * 352.7 E 338.6 * 356.5 2 1 231 * 359.0 38 64 2.2 3653 25.0 600 209 1971 \$.C.\$ DESIGN CRITERIA AND COST DATA. (1) COSTS ARE BASED ON 1971 \$.C.\$ DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 827 C ***********************************	812 DA= 2.74 SQ MI = 1		- SHIRLEY MAS			E 42-33-0	F LONG	TUDE 71-42-0
0 0.0 19 1.7 + 332.7 E 606 4.1 2910 + 335.1 120 + 337.9 16 9 + + + 100 0.7 17730 50 35730 4.6 + 331.1 E 447 3.0 3960 + 333.6 110 + 335.4 13 6 + 13 6 + 18 11 5.5 2340 118 16140 12.7 + 337.2 E 1147 7.8 1650 + 347.2 183 + 349.6 20 14 + 18 16140 12.7 + 337.2 E 1147 7.8 1650 + 347.2 183 + 349.9 28 32 + 349.8 1080 162 12530 20.2 + 344.7 E 2318 15.8 880 + 347.2 183 + 349.9 28 32 + 3653 22.6 660 196 11060 28.2 + 352.7 E 3836 26.2 570 + 355.5 241 + 359.0 37 62 + 3653 25.0 600 209 10480 30.0 + 354.5 E 4222 28.9 520 + 356.5 241 + 359.7 38 64 + **********************************	0 0.0 0 19 1.7 * 332.7 E 606 4.1 2910 * 335.1 120 * 337.8 100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.8 110 * 335.	0 0.0 19 1.7 7 30 5 7 3 5 7 3 6 4 6 4 3 1 2 1 2 1 1 2 1 1 2 1 1 2 1 2 1 2 1 2	0 0.0 19 1.7 * 332.7 E 606 4.1 2910 * 335.1 120 * 337.9 16 9 * **** 100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.4 13 6 8 0.3 110 0.7 17730 50 35730 4.6 * 331.2 E 1147 7.8 1650 * 339.6 150 * 341.6 20 14 * 1.1 110 1 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 341.6 20 14 * 1.1 111 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 1.7 112 12.8 1080 162 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.0 37 62 * 2.2 113 12.8 660 196 11060 28.2 * 354.5 E 4222 28.9 550 * 355.5 241 * 359.7 38 64 * 2.2 112 12 12 12 12 12 12 12 12 12 12 12 12	RATING (3)	100-YR	SPWY DESIGN		11	10 IN,	EAK FLOV	18
100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.4 13 6 * 811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 341.6 20 14 * 8187 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 3298 22.6 660 196 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.0 37 62 * 365.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.7 38 64 * * *******************************	100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.8 811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 347.2 183 * 349.8 1877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.8 32.6 660 196 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.8 3653 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 355.5 241 * 359.8 (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL (3) EMERGENCY SPILLWAY TYPE CODE— C.CONCRETE CHUTE. D.CONCRETE OR OP. E.F. EXCAVATED. TE TWO	100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.4 13 6 * 0.3 811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 341.6 20 14 * 1.1 1877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 1.7 32.8 1.0 196 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.0 37 62 * 2.2 365.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.7 38 64 * 2.2 365.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.7 38 64 * 2.2 365.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.7 38 64 * 2.2 365.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.7 38 64 * 2.2 365.0 600 209 10480 20.5 DESIGN CRITERIA AND COST DATA. (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	100 0.7 17730 50 35730 4.6 * 331.1 E 447 3.0 3960 * 333.6 110 * 335.4 13 6 * 0.3 811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 333.6 150 * 341.6 20 14 * 1.1 877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 1.7 8298 22.6 660 196 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.0 37 62 * 2.2 8363 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 355.5 241 * 359.7 38 64 * 2.2 8***********************************	0 0 0	7.755 #	1 7				16	
811 5.5 2340 118 16140 12.7 + 337.2 E 1147 7.8 1650 + 339.6 150 + 341.6 20 14 + 1877 12.8 1080 162 12530 20.2 + 344.7 E 2318 15.8 880 + 347.2 183 + 349.9 28 32 + 3298 22.6 660 196 11060 28.2 + 352.7 E 3836 26.2 570 + 355.1 231 + 359.0 37 62 + 3653 25.0 600 209 10480 30.0 + 354.5 E 4222 28.9 520 + 356.5 241 + 359.7 38 64 + 4*********************************	811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 341.8 187 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.8 329.6 660 196 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.8 35.3 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.8 ************************************	811 5.5 2340 118 16140 12.7 + 337.2 E 1147 7.8 1650 + 339.6 150 + 341.6 20 14 + 1.1 1877 12.8 1080 162 12530 20.2 + 344.7 E 2318 15.8 880 + 347.2 183 + 349.9 28 32 + 1.7 3298 22.6 660 196 11060 28.2 + 352.7 E 3836 26.2 570 + 355.1 231 + 359.0 37 62 + 2.2 3653 25.0 600 209 10480 30.0 + 354.5 E 4222 28.9 520 + 356.5 241 + 359.7 38 64 + 2.2 **********************************	811 5.5 2340 118 16140 12.7 * 337.2 E 1147 7.8 1650 * 339.6 150 * 341.6 20 14 * 1.1 1877 12.8 1080 162 12530 20.2 * 344.7 E 2318 15.8 880 * 347.2 183 * 349.9 28 32 * 1.7 3298 22.6 660 196 11060 28.2 * 352.7 E 3836 26.2 570 * 355.1 231 * 359.0 37 62 * 2.2 3653 25.0 600 209 10480 30.0 * 354.5 E 4222 28.9 520 * 356.5 241 * 359.7 38 64 * 2.2 ********************************	100 0.7 17730 50	* 331.1	3.0	*	110		13	*
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**************************************	**************************************	**************************************	(1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. (5) ELEVATIONS ARE SHOWN TO THE NFAREST O.1 FOOT TO SHOW VARIATION BFTWEFN DEVELOPMENTS ONLY. AND ARE NOT TO		354.5 E	28.9	*	241		38	*
 (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE- C.CONCRETE CHUTE, D.CONCRETE DROP, E.EXCAVATED, T. TWO SPILLWAYS, N= (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPO 	 (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL (3) EMERGENCY SPILLWAY TYPE CODE— C.CONCRETE CHUTE. D.CONCRETE DROP. E=FXCAVATED. T= TWO 	 (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. 	 (1) COSTS ARE BASED ON 1971 S.C.S. DESIGN CRITERIA AND COST DATA. (2) EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. (3) EMERGENCY SPILLWAY TYPE CODE— C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE (4) TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. (5) ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY. AND ARE NOT TO 		******	*	*	* * * *	*******	******	********
EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION, FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPORTED.	EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE. D=CONCRETE DRDP. E=FXCAVATED. T= TWD	EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	EMERGENCY SPILLWAY TYPE CODE—C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLWAYS, N= NONE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. ELEVATIONS ARE SHOWN TO THE NFAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY. AND ARE NOT TO	- (1) COSTS ARE BASED ON (2) EMERGENCY APTITIMAY	COSTS ARE BASED	AND COST DATA	n H	HIDTING BEN		וטנ	
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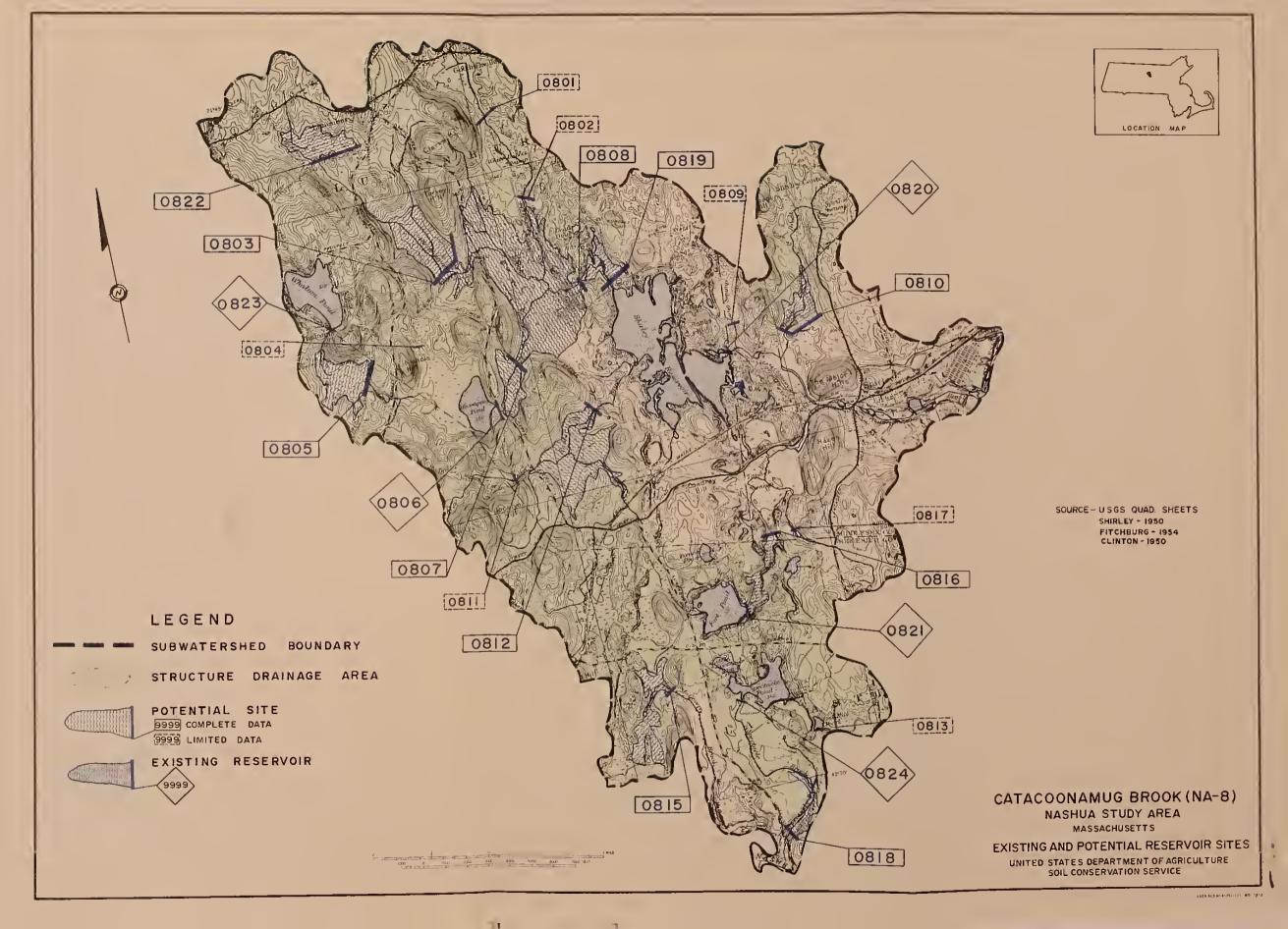
** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

## HIGH HATER ## COST COST	***	中央市场中央市场中央市场中央市场中央市场市场市场市场市场市场市场市场市场市场市场	BENEFE	RENEETCIAL POOL		****	*		FMFRGE	dV AUN	V 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	※本位の本の本の本の本の本の本の本の本の本の本の本の本の本の本の本の本の本の本の	**************************************	* * * * * * * * * * * * * * * * * * *	***	***	***	***	****
STORAGE PER					3								HIGH	MATER				*	IELD
STORAGE PER AREA SURF AT ELEV AT CREST PER ELEV AREA ELEV HOT VOICE (1000) AC FT IN (\$1 10 10 10 10 10 10 10	* * * *	***	****	*******	* * * *	********COST/	###### DFPTH		*******	***** STORAG	****	*	****	***	******	****	****	**** A	T 95
ACCOUNTY Color C	ELEV	STOR	AGE	PER AC FT	AREA	SURF	AT	. :	. V . P E	AT CRE	ST	-						00	ANCE
DA= 0.63 SQ MI = 403 AC	(MSL)	AC FT	Z = 1	(\$)	(AC)	(5)	(FT)		SL) A	C FT	Z	(\$)	(MSL)	(AC)	- (MS	L) F1		CY) = (MGD)
100 3.0 3050 36 8560 9.5 8 376.4 E 139 4.1 1930 8 382.1 5 8 8 8 8 8 8 8 8 8	NA-0815 SITE	RATING	(3)	DA= 0.	63 SQ M WATE	MI = R QUALI	403 AC TY (B)		SGS QUA	D- SHI	RLEY M	ASS N STORM	RUNO	LATITU FF =	JE 42-	30-54	LONGI	TUDE 71	-41-58 0 CFS
100 3.0 3050 36 6560 9.5 8 370.0 E 214 6.4 1420 8 80.1 1 6 8 8 8 8 2 20 10 8 8 8 8 6 8 8 1 1 8 8 8 8 8 8	370.4	0	0.0		4		4.4		76.4 E	139	4.1	1930		5.5	* 38	1.5	91	* 2	*
10	375.5	100	3.0	3050	36	8560	9.5	* *	1		6.4	1420 #	380.				17	* *	0.18
RATING (3) STREAM MATER QUALITY (B) 100-YR PRIN SPMY DESIGN SIGN MUNDEF = 8.10 IN. PEAK FLON = 8.00 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	380.4	353	10.5	1010	67	5320	14.3		l l		16.2	650 4	383				20		0.36
DA= 1.29 SQ HI = 826 AC		***	*	***			0			***************************************				***				*	***************************************
0 0.0 0 4 4 4.6 * 332.1 E 286 4.1 6120 * 334.4 65 * 337.0 22 19 * 32.0 10 1.5 17230 16 106940 15.0 * 377.5 E 155 2.3 11130 * 330.0 23 * 332.0 22 19 * 32 * 32 * 32 * 32 * 32 * 32 * 32 * 3	NA-0816 SITE	RATING	(3)	DA= 1.	29 SQ M MATE	MI =	826 AC TY (B)		SGS QUA	D- SHI	RLEY M	ASS N STORM	RUNO	LATITU FF =	JE 42-	31-51	LONGI	TUDE 71	-40-34 9 CFS
100 1.5 17230 16 106940 15.0 # 327.5 E 155 2.3 11130 # 330.0 23 # 332.0 22 19 # 245 3.5 7400 36 50980 21.2 # 333.7 E 780 5.4 4900 # 336.2 82 # 348.2 28 32 # 256 360 83 23470 26.2 # 338.7 E 1450 # 346.2 82 # 348.2 39 67 # 311.1 16.2 1890 126 16790 31.7 # 344.2 E 1452 21.1 1450 # 345.6 143 # 349.2 39 67 # 311.1 16.2 1890 126 16420 32.5 # 345.0 E 1563 22.7 1360 # 346.2 146 # 349.9 40 70 # 345.8 # 345.0 E 1563 22.7 1360 # 346.2 146 # 349.9 40 70 # 345.8 # 345.0 E 1563 22.7 1360 # 346.2 146 # 349.9 40 70 # 345.8 # 345.0 E 1563 22.7 1360 # 346.2 146 # 349.9 40 70 # 345.8 # 345.0 E 1563 22.7 1360 # 346.2 146 # 349.9 40 70 # 345.8	314.6	0	0.0		4		4.6			286	4.1	6120 *		65	* *	2002	27	* * 5	*
536 7.8 3660 83 2070 61.2 5.2 7 338.7 E 788 11.5 490 8 340.4 6 34.9 5 6 7 8 11.7 16.2 1890 126 16790 31.7 8 344.2 E 1452 21.1 1450 8 345.6 143 8 349.2 39 67 8 11.7 1740 129 16420 32.5 8 345.0 E 1563 22.7 1360 8 346.2 146 8 349.9 40 70 8 70 8 11.7 1740 129 16420 32.5 8 345.0 E 1563 22.7 1360 8 346.2 146 8 349.9 40 70 8 70 8 11.8 17.7 1740 129 16420 32.5 8 345.0 E 1563 22.7 1360 8 346.2 146 8 349.9 40 70 8 8 70 8 8 21.4 8 312.1 E 398 4.1 2060 8 314.6 123 8 317.7 38 63 8 8 10 1.0 1.0 8030 32 25050 26.7 8 309.2 E 208 2.2 3870 8 316.2 151 8 318.6 39 67 8 70 8 2 1270 142 770 35.8 8 318.2 E 1206 12.6 530 8 323.0 249 8 326.1 46 118 8 12.0 14.2 770 39.8 8 322.2 E 2073 211.6 530 8 323.0 249 8 326.1 46 1104 8 21.2 22.0 550 243 4770 42.5 8 325.0 E 2762 28.7 420 8 325.4 280 8 328.4 48 118 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	325.0	100	1.5	17230		106940	15.0	# 3	1	155	2.3	11130	330		± 33		22		0.24
1117 10-2 1890 120 16420 32-7 1360 8 345-0 1453 8 349-9 70 8 1118 17.7 1740 120 16420 32-5 8 345-0 E 1563 22-7 1360 8 346-0 146 8 349-9 40 70 8 ***********************************	336.2	536	8.7	3660	83	23470	26.2	n (n) (1	11.5	2490	341.		+ 34		35		0.65
RATING (3) STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNGFF = 8.10 IN, PEAK FLOW	342.5			1740	129	16420	32.5		İ		22.7	1360	346.		* 34		40		0.95
## COUNCIDED STREAM WATER QUALITY (B) 100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW = 8	*******			**************************************	*****	**************************************	152 AC		*******	 D- CLI	NOLV	######		LATITU	******)E 42-	29-39	LONGI	TUDE 71	-41-06
### ##################################	SITE	RATING		STREA	M WATE	R QUALI	TY (B)	9	- 1	N SPWY	DESIG	N STORP	RUND	4	part	N, PEA	K FLOW	"	3 CFS
100 1.0 8030 32 25050 26.7 # 309.2 E 208 2.2 3870 # 311.6 73 # 313.1 33 46 # 0.2 43 330 3.4 2710 71 12670 31.4 # 313.9 E 566 5.9 1580 # 316.2 151 # 318.6 39 67 # 0.5 7 790 8.2 1270 142 7070 35.8 # 318.2 E 1206 12.6 830 # 323.0 249 # 323.2 43 89 # 0.9 7 1480 15.3 740 207 5250 39.8 # 322.2 E 2073 21.6 530 # 323.0 249 # 326.1 46 104 # 1.2 5 2112 22.0 550 243 4770 42.5 # 325.0 E 2762 28.7 420 # 325.4 280 # 328.4 48 118 # 1.4 4	301.4	0	0.0		∞		21.4	• •		398	4.1						38	• •	**
750 5-4 2/10 /1 126/0 51-4 515-9 E 506 5-9 1580 = 516-2 151 = 518-6 59 6/7 = 0.5 770 8.2 1270 142 7070 35-8 = 318-2 E 1206 12-6 830 = 319-9 210 = 323-2 43 89 = 0.9 7 1480 15-3 740 207 5250 39-8 = 322-2 E 2073 21-6 530 = 323-0 249 = 326-1 46 104 = 1.2 7 2112 22-0 550 243 4770 42-5 = 325-0 E 2762 28-7 420 = 325-4 280 = 328-4 48 118 = 1.4 7 112 22-0 550 249 4 325-0 E 2762 28-7 420 = 325-4 280 = 328-4 48 118 = 1.4 7 112 22-0 550 249 4 325-0 E 2762 28-7 420 = 325-4 280 = 328-4 48 118 = 1.4 7 112 22-0 550 249 4 325-0 E 2762 28-7 420 = 325-4 280 = 328-4 48 118 = 1.4 7 12 22-0 550 249 4 325-0 E 2762 28-7 420 = 325-4 280 = 328-4 48 118 = 1.4 7 12 22-0 550 249 4 325-0 E 2762 28-7 420 = 325-4 280 = 328-4 48 118 = 1.4 7 13 EMERGENCY SPILLMAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL. 7 1 TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. 7 1 TABULAR DATA ARE SHOWN-TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO CONSTORED ACCIDATE TO THAT DECREE	306.7	100	1.0	8030	32	25050	26.7	•		208	2.2	1		•	* 31		33	* :	0.27
7 1480 15.3 740 207 5250 39.8 * 322.2 E 2073 21.6 530 * 323.0 249 * 326.1 46 104 * 1.2 5 2112 22.0 550 243 4770 42.5 * 325.0 E 2762 28.7 420 * 325.4 280 * 328.4 48 118 * 1.4 ************************************	315.7	790	8.2	1270	145	7070	35.8	* *		- 1	12.6						43	* *	0.93
*************************************	322.5	1480	15.3	740	207	5250	39.8	* *	22.2 E	2073	21.6	530 4	323.	0 249	* 32	8.4	46	104 *	1.25
EMERGENCY STILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLOSING BENEFICIAL FOLLS. EMERGENCY SPILLWAY TYPE CODE— C = CONCRETE CHUTE, D = CONCRETE DROP, E = EXCAVATED, T = TWO SPILLWAYS, N = NONE TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES. ELEVATIONS ARE SHOWN TO THE NEARST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO FORSIDED ACCURATE TO THAT DECREE	NOTES -	(1) CO	STS AR	E BASED	******	71 S.C.	S. DES	IGN C	ITERIA	AND C	0ST DA	TA.	*****	*****	* 4		*	**	*
ELEVATIONS ARE SHOWN TO THE NEAREST 0.1 FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO			ERGENC BULAR	Y SPILL	MAY TY	PE CODE O ON PR	- C=COI	NCRETI	CHUTE	, D=C0	NCRETE 1GURES		E=EXCA ARE PR	VATED,	T= TW	SPILL	MAYS,	N= NON URPOSES	ш.
			EVAT 10	NS ARE	SHOWN	TO THE	NEARES	T 0.1	F00T 1	MOHS O	VARIA	TION BE	TWEEN	DEVELO	MENTS	ONLY,	A QNA	RE NOT	0

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

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-230-Notes





NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-9, Mulpus Brook

The Mulpus Brook Subwatershed covers about 10,300 acres in Lunenburg, Worcester County, and Shirley and Townsend, in Middlesex County.

The main stream in this subwatershed is Mulpus Brook, originating in Lunenburg, above Hickory Hills Lake and flowing southeasterly through Shirley to its confluence with the Nashua river. Elevations range from a high of about 740 feet in Lunenburg to about 260 feet on the Nashua River flood plain. Geology within the Mulpus Brook subwatershed is characterized by schist bedrock at depths of 10 to 25 feet, overlain by glacial till or englacial drift.

Eight potential reservoir sites and one existing reservoir were studied. Design summaries are included for seven potential sites.

SITE NA-0901

Location:

On Mulpus Brook approximately 1,400 feet upstream from Cross Street in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35°57" Longitude: 71°40'53"

Facilities Affected:

Below Elevation 370

2 houses 2350 feet of Mulpus Road 2750 feet of Route 2A 1000 feet of Elmwood Street

Below Elevation 365

2 houses 1200 feet of Mulpus Road 2450 feet of Route 2A 800 feet of Elmwood Street

Below Elevation 360

2 houses 300 feet of Mulpus Road 2000 feet of Route 2A 700 feet of Elmwood Street

SITE NA-0901 (cont'd)

Geologic Conditions:

The right abutment is thin englacial drift shallow to bedrock with schist outcrops at higher elevations. The left abutment is thin englacial drift with numerous outcrops at all elevations. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There is a leakage problem on the right side of the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to good depending upon whether a cutoff is made beneath the sand terrace.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete chute emergency spillway may be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

About 90% of the site is owned by the Town of Lunenburg.

SITE NA-0902

Location:

On a tributary to Mulpus Brook approximately 5,500 feet upstream from Valley Island Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°37'20" Longitude: 71°43'57"

Facilities Affected:

No facilities affected below elevation 445.

SITE NA-0902 (Cont'd)

Geologic Conditions:

The right abutment is thin englacial drift, shallow to bedrock. The left abutment is thin englacial drift with granite outcropping at higher elevations. Depth to granitic bedrock in the foundation is not knwon, but may be 10 to 20 feet. There is a leakage problem in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good if a positive cutoff is made to bedrock in the foundation and left abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0903

Location:

On tributary to Mulpus Brook approximately 1600 feet upstream from Northfield Road in Lunenburg, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°36'23" Longitude: 71°43'42"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (230 acres). Therefore, no further investigations were made.

SITE NA-0904

Location:

On Beaver Brook at Little Turnpike in Shirley, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°34'59" Longitude: 71°40'01"

SITE NA-0904 (cont'd)

Facilities
Affected:

Below Elevation 330

1 house

2200 feet of Barrage and Whitney Streets

Geologic Conditions:

Both abutments are outwash sand and gravel probably shallow to schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 10 to 15 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear to be fair to good depending upon whether a cutoff is made to bedrock on both abutments.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-0905

Location:

On Mulpus Brook approximately 750 feet upstream from Townsend Road in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°35'17" Longitude: 71°39'09"

Facilities Affected:

Below Elevation 320

28 houses storage building gun club building

motel barn

3000 feet of Groton Road

Route 2A Mulpus Road Townsend Road Longley Road Parker Road Below Elevation 300

10 houses
motel
Route 2A
Townsend Road
Longley Road
Parker Road

Below Elevation 285

l house Route 2A Townsend Road Longley Road

SITE NA-0905 (cont'd)

Geologic Conditions:

Both abutments are thin glacial till, shallow to bedrock, with some rock outcrops on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilties appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0906

Location:

On Mulpus Brook approximately 2,500 feet upstream in Shirley, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°34'37" Longitude: 71°38'13"

Facilities Affected:

> 44 houses lumber yard restaurant store gas station auto dump motel storage building shell club 14000 feet of Route 2A

3200 feet of Mulpus Road

Below Elevation 320

Below Elevation 300 22 houses lumber yard restaurant store gas station auto dump storage building shell club 650 feet of Groton Road 3000 feet of Groton Rd. 14000 feet of Route 2A 3200 feet of Mulpus Road Below Elevation 280

1 house

Conditions:

Both abutments are thin glacial till, shallow to bedrock, with some rock outcrops on the left abutment. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Geologic -

SITE NA-0906 (cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0907

Location:

On Mulpus Brook approximately 2,200 feet upstream from Valley Island Road in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

Latitude: 42°37'01" Longitude: 71°43'28"

Facilities Affected:

Below Elevation 440 250 feet of Holman Road

Geologic Conditions:

The right abutment is thin englacial drift, shallow to bedrock. The left abutment is thin englacial drift with schist outcropping at higher elevations. Depth to schist bedrock in the foundation is not known, but may be 10 to 20 feet. There are leakage problems in the right abutment and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good provided a positive cutoff can be made beneath the sand terrace in the foundation.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-0908

Location:

On Flurcum Swamp approximately 2,200 feet upstream from Route 2A in Lunenburg, Massachusetts.

Shirley, Massachusetts Quadrangle

SITE NA-0908 (cont'd)

Latitude: 42°35'31" Longitude: 71°41'36"

Facilities Affected:

700 feet of Arbor Street

Geologic Conditions:

Both abutments are outwash sand and gravel and swamp at lower elevations. Depth to schist bedrock in the foundation is not known but may be 55 to 65 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Public Ownership:

About 5% of the site is owned by the Town of Lunenburg.

SITE NA-0909 -- HICKORY HILLS LAKE

(Formerly Dickinson Pond)

Location:

Near Townsend Harbor Road in Lunenburg,

Massachusetts.

Shirley, Massachusetts Quadrangle.

Surface Area (Acres)

Height of Dam (Ft.)

20

Drainage Area (Acres) (Sq. Mi.) 4850 7.6

330

Potential for

Expansion:

Appears to have potential for expansion.

A very long dam would be required and

many cottages would be affected.

Remarks:

This is a long earth-fill dam. The concrete spillway has eight bays equipped with flashboards, outletting on a rock riprapped chute. Gate works appear inoperative. Structure appears in fair condition; there are a few cracks in the concrete.

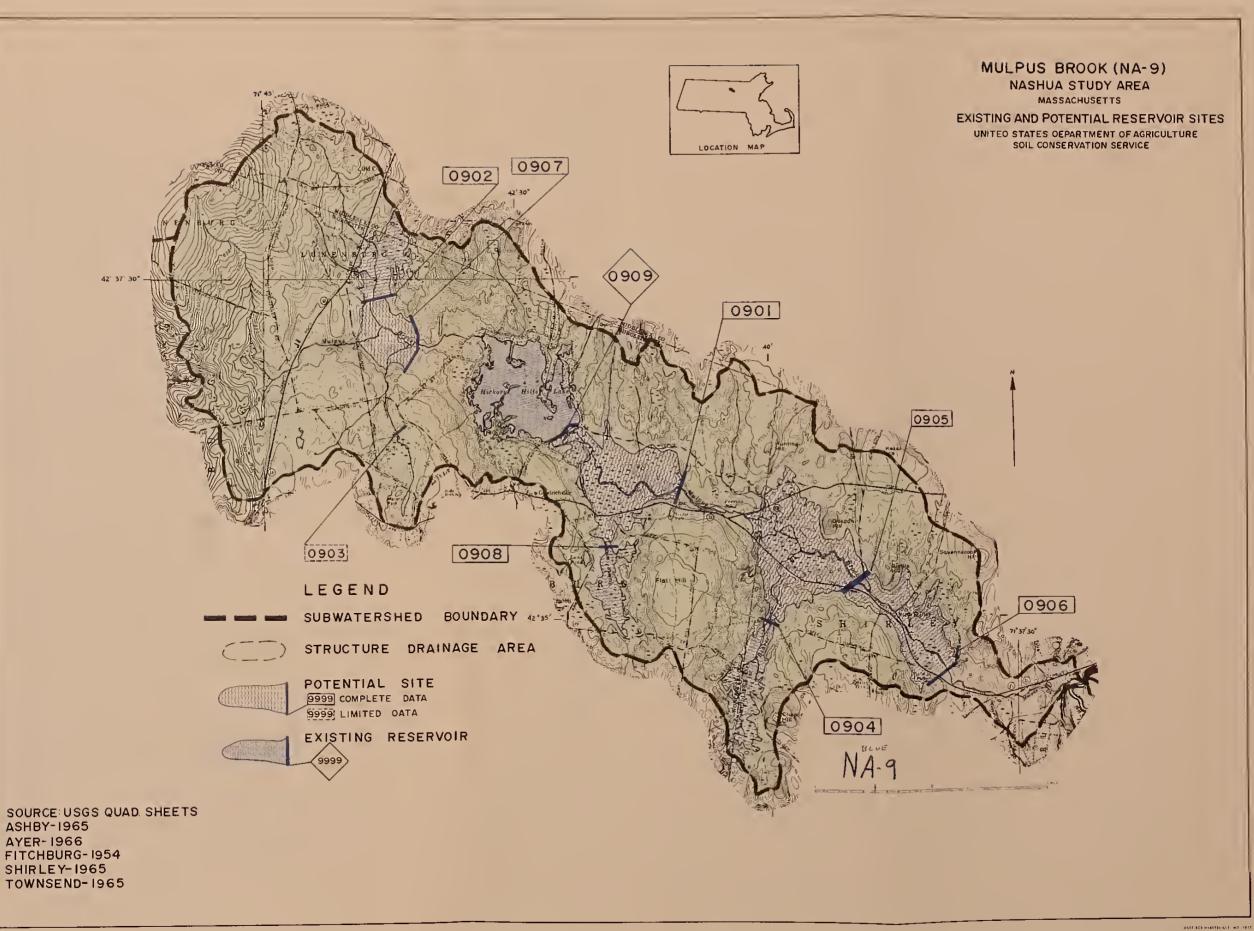
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SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

	BENEF	BENEFICIAL POOL	101			# EME	RGENCY	EMERGENCY SPILLWAY * DESIGN * DAM * SAFE	١٨	Q *	DESIGN	*		DAM		* SAFE	
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SITE RA	SITE RATING (3)	STREA	M WATE	STREAM WATER QUALITY (B)	TY (B)	100-YR	PRIN SI	100-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW =	GN STOR	M RU	NOFF =	8.10	IN,	EAK FL	= MO	226 CFS	S
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J	(2) EMERGEN	EMERGENCY SPILLWAY STORAGE AND COSTS ARE BASED ON TOTAL STORAGE, INCLUDING BENEFICIAL POOL.	WAY ST	ORAGE A	ND COST	S ARE BA	SED ON	TOTAL S	TORAGE	INCL	UDING	ENEFI	CIAL	.000			
	3) EMERGEN	EMERGENCY SPILLMAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP, E=EXCAVATED, T= TWO SPILLMAYS, N= NONE	WAY TY	PE CODE	- C=CON	CRETE CH	IUTE, D:	-CONCRET	E DROP,	E≖EX	CAVATE	± T ±	TWO SI	ILLWAY	S , N=	NONE	
2	(4) TABULAR	TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN ARE PRIMARILY FOR COMPARISON PURPOSES.	E BASE	D ON PR	EL IMINA	RY INFOR	MATION.	. FIGURE	S SHOWN	ARE	PRIMAR	LY FO	R COM	ARISON	PURPC	SES.	
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-242-Notes





NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-10, Squannacook River

The Massachusetts portion of the Squannacook River Subwatershed covers about 36,300 acres in Ashburnham, Fitchburg, and Lunenburg, in Worcester County and Ashby, Groton, Pepperill, Shirley and Townsend, in Middlesex County.

There is a U. S. Geological Survey stream gaging station on the Squannacook River in Shirley.

The Squannacook River originates in New Hampshire and flows southerly through Ashby, Townsend, Groton and Shirley to its confluence with the Nashua River. Elevations in Massachusetts range from a high of about 1,500 feet on Blood Hill to about 200 feet at the confluence. Geology in the subwatershed is characterized by schist bedrock at depths of 5 to 20 feet overlain by glacial till or outwash sand and gravel. Some granitic bedrock at depths of 50 to 100 feet was noted in the area of West Townsend.

Twenty-three potential reservoir sites and five existing reservoirs were studied. Design summaries are included for 16 potential sites that met study criteria.

SITE NA-1001

Location:

On Trapfall Brook at Harris Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°41'23" Longitude: 71°49'20"

Facilities Affected:

Below Elevation 880 Below Elevation 875

4 houses 3 houses 2 barns 2 barns

900 feet of New Ipswich Road 550 feet of New Ipswich Road 1500 feet of Harris Road

Below Elevation 870

Below Elevation 860

2 houses

l house

100 feet of New Ipswich Rd.

1500 feet of Harris Road

1500 feet of Harris Road

SITE NA-1001 (cont'd)

Geologic Conditions:

Both abutments are silty sand and gravel (glacial till) with approximately 30 percent boulders. Depth to schist bedrock in the foundation is not known, but may be 10 to 15 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA~1002

Location:

On a tributary to Ashby Reservoir approximately 200 feet downstream from Piper Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°39'55" Longitude: 71°50'15"

Facilities Affected:

Below Elevation 995 Below Elevation 990 1400 feet of Erickson Road 2 houses 2000 feet of Piper Road 1400 feet of Erickson Road 500 foot driveway 2000 feet of Piper Road 2 houses 500 foot driveway 3 barns 3 barns

Below Elevation 965 1 barn 2000 feet of Piper Road

Geologic Conditions:

The left abutment is silty sand and gravel (glacial till). The right abutment is outwash sand, medium coarse with some gravel. Depth to schist bedrock in the foundation is not known, but may be 15 to 25 feet. There is a slight leakage problem in the right abutment. Impervious borrow material for dam construction is available on site. Waterholding capabilities are fair.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1003 -- ASHBY RESERVOIR

Location:

On Willard Brook, 3000 feet upstream of South Village in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle.

Latitude: 42°39'40" Longitude: 71°49'37"

Surface Area (Acres)

Height of Dam (Ft.)

Drainage Area (Acres) (Sq. Mi.)

42

15

4.27 2730

Potential

for

Expansion:

Could be expanded, but cottages and South Road would be affected and dam would have to be rebuilt.

Remarks:

This is an earth-fill dam. The spillway at the right abutment is an ogee section about 40 feet wide. Slopes of the dam are covered with trees. There is some slope erosion visible on the upstream slope. Entire structure is in fair condition.

Geologic Conditions:

Both abutments are thin discontinuous outcrops of silt sand and gravel glacial till underlain by schist bedrock. There are no apparent leakage problems, but there could be some seepage through the left abutment. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear good.

Location:

On an unnamed stream near Wright Pond approximately 1900 feet downstream from Richardson Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°39'02" Longitude: 71°48'42"

Facilities Affected:

Below Elevation 990
2 houses
2 houses
12 cottages
10 sheds
2 houses
10 sheds

1500 feet of Richardson Road 1100 feet of Richardson

Road

Below Elevation 980

1 house
12 cottages

Below Elevation 975

1 house
1 shed

10 sheds

Geologic Conditions:

Both abutments are thin discontinuous deposits of silty sand and englacial drift with many outcrops of schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 5 to 10 feet. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1005

Location:

On Trapfall Brook approximately 4100 feet upstream from Greenville Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°41'00" Longitude: 71°48'18"

SITE NA-1005 (contid)

Facilities Affected:

Below Elevation 770

Below Elevation 760

3 houses 1 barn 1 house

1700 feet of Mason Road 1700 feet of Foster Road 625 feet of Mason Road

Geologic Conditions:

Both abutments are sand and gravel (englacial drift) with cobbles and boulders and very shallow to bedrock. There is schistose rock at the surface of the stream at the foundation. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Water-holding capabilities appear good providing there is a shallow cut-off trench to bedrock at both abutments.

SITE NA-1006

Location:

On Pearl Hill Brook approximately 2,500 feet upstream from Old Battery Road in Townsend, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°40'16" Longitude: 71°45'22"

Facilities Affected:

Below Elevation 360 1 house

Geologic Conditions:

The left abutment is silty and gravel (glacial till). The right abutment is outwash sand and gravel. Depth to granite gneiss bedrock in the foundation is not known but may be 80 to 100 feet deep. There are leakage problems in the foundation and the right abutment. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear very poor.

SITE NA-1006 (cont'd)

Engineering Notes:

The recommended location for an excavated emergency spillway is at the right abutment. Well fields for the Town of Townsend are below the centerline of the dam. Preliminary structure designs indicate that a concrete emergency spillway (chute or drop structure) may be needed to avoid excessive velocity in an excavated emergency spillway.

Public Ownership:

The Massachusetts Department of Natural Resources owns about 95% of this site.

SITE NA-1007

Location:

On Walker Brook approximately 3,600 feet upstream from Mason Road in Townsend, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°40'55" Longitude: 71°45'03"

Facilities Affected:

This site has been eliminated from further study due to excessive facilities and poor geologic conditions.

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to granitic bedrock in the foundation is not known but may be 90 to 100 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities are poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Location:

At outlet to Ash Swamp approximately 500 feet upstream (East) of Mason Road in Townsend, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42⁰41'17" Longitude: 71⁰45'03"

Facilities Affected:

Below Elevation 325

1 house

2800 feet of Old Turnpike Road

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to granitic bedrock in the foundation is not known but may be 50 to 60 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities are poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

Public Ownership:

About 20% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-1009

Location:

On Bayberry Hill Brook approximately 600 feet upstream from Bayberry Hill Road in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°39'17" Longitude: 71°43'49"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (303 acres). Therefore, no further investigations were made.

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Location:

On Squannacook River approximately 350 feet upstream from Turnpike Road in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°40'39" Longitude: 71°43'33"

Facilities Affected:

This site was eliminated from further study due to high damage to facilities; Boston & Maine Railroad, Route 119,

Mason Road, and housing.

SITE NA-1011

Location:

On Squannacook River approximately 2000 feet upstream from Route 119 in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°40'25" Longitude: 71°42'40"

Facilities Affected:

Below Elevation 310

16 houses

1 barn

1 barn

1 barn

1 barn

400 feet of Turnpike Road 400 feet of Turnpike Road 500 feet of secondary road 500 feet of secondary road

Below Elevation 300 ·

2 houses

400 feet of Turnpike Road 500 feet of secondary road

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to schist bedrock in the foundation is not known but may be 70 to 80 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

SITE NA-1011 (Cont'd)

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Inflow is sufficient to overcome a considerable seepage loss and on this basis the site would be good. Preliminary structure designs indicate that a concrete drop structure would probably be the primary emergency spillway.

Public Ownership:

About 5% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-10]2 -- BIXBY RESERVOIR

Location:

On a tributary to Bixby Brook, approximately 1800 feet upstream of Emery Road in Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle.

Latitude: 42°38'25" Longitude: 71°42'54"

Surface Area
(Acres)

Height of Dam (Ft.)

12

Drainage (Acres)

590

Area (Sq. Mi.)

0.92

21

Potential for Expansion:

Geologic conditions might limit further expansion.

No facilities would be affected.

Remarks:

This is an earth-fill dam with a 15 foot wide chute spillway. The spillway and dam are in good condition, except for some trees growing in the fill.

Geologic Conditions:

Both abutments are fine, poorly graded sand with some gravel, glacial outwash, and kame terrace. Depth to schist bedrock in the foundation is not known, but may be 80 to 90 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear fair to poor.

Location:

On Witch Brook approximately 800 feet upstream from Warren Road in Townsend, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: 42°38'24" Longitude: 71°40'29"

Facilities Affected:

No facilities affected below elevation 300.

Geologic Conditions:

The left abutment is poorly graded sand, possibly bedded kame terrace. The right abutment is poorly graded sand and gravelsmall esker. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1014

Location:

On Witch Brook approximately 600 feet upstream from Pierce Road in Townsend, Massachusetts.

Townsend Massachusetts Quadrangle

SITE NA-1014 (Cont'd)

Latitude: 42°37'44" Longitude:71°41'22"

Facilities Affected:

No facilities affected below elevation 365.

Geologic Conditions:

The left abutment is outwash sand and gravel. The right abutment is kame terrace sand and gravel. Depth to bedrock in the foundation is not known, but may be 15 to 25 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment. Drilling may prove hills to be bedrock cored.

SITE NA-1015

Location:

On Squannacook River near town boundary between Shirley and Townsend in Shirley, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: 42°38'03" Longitude: 71°39'35"

Remarks:

Drainage Area: 56 square miles This site did not meet criteria for this study. Contributing drainage area is larger than 50 square miles. Therefore, no further investigations were made.

Location:

On Trap Swamp Brook approximately 250 feet upstream from Squannacook Road in Shirley, Massachusetts.

Shirley Massachusetts Quadrangle

Latitude: 42°36'45" Longitude: 71°39'00"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area (218 acres). Therefore, no further investigations were made.

SITE NA-1017

Location:

On a tributary to the Squannacook River approximately 500 feet upstream from Proctor Road in Townsend, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: 42°39'37" Longitude: 71°39'46"

Facilities Affected:

Below Elevation 320

3 houses 600 feet of West Street 2500 feet of Haynes Road

Below Elevation 315

2 houses 550 feet of West Street 2500 feet of Haynes Road

Below Elevation 310

1 house 2500 feet of Haynes Road

SITE NA-1017 (Cont'd)

Geologic Conditions:

Both abutments are outwash sand and gravel with 20 to 30 percent small cobbles, 4 to 6 inches in diameter at the surface. Depth to schist in the foundation is not known, but may be 30 to 40 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1018

Location:

On Bixby Brook approximately 1200 feet upstream from Meeting House Road in Townsend, Massachusetts.

Townsend Massachusetts Quadrangle

Latitude: 42°38'56" Longitude: 71°41'31"

Facilities Affected:

No facilities affected below elevation 290.

SITE NA-1018 (Cont'd)

Geologic
Conditions:

Both abutments are fine, poorly graded sand with some gravel - complex glaciofluvial deposits. Depth to schist bedrock in the foundation is not known but may be 40 to 50 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an excavated emergency spillway is at the left abutment. Preliminary structure designs indicate that a concrete emergency spillway (monolithic conduit) may be required to avoid excessive velocity in an excavated spillway.

Public Ownership:

About 10% of the site is owned by the Massachusetts Department of Natural Resources.

SITE NA-1019

Location:

On a tributary to Ashby Reservoir approximately 700 feet upstream from South Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°38'52" Longitude: 71°50'01"

Facilities Affected:

Below Elevation 980 Below Elevation 975

2 houses 1 barn 1450 feet of Piper Road 100 1250 feet of Richardson Road

1 barn 1000 feet of Piper Road

2 houses

Below Elevation 965 400 feet of Piper Road Below Elevation 960
250 feet of Piper Road

SITE NA-1019 (cont'd)

Geologic Conditions:

The right abutment is sand and gravel at the toe and glacial till higher on the abutment. The left abutment is outwash fine sand. Depth to schist bedrock in the foundation is not known but may be 40 to 50 feet. There are leakage problems in both abutments but leakage should not be high. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 10 per cent. Water-holding capabilities appear fair.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1020

Location:

On Locke Brook approximately 250 feet upstream from Route 31 in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°41'49" Longitude: 71°47'20"

Facilities Affected:

Below Elevation 700

5 houses 2 barns

1000 feet of Locke Road 900 feet of Heywood Road

Below Elevation 690 houses 1 barn 1000 feet of Locke Road 700 feet of Heywood Road

Below Elevation 685

2 houses

1000 feet of Locke Road 550 feet of Heywood Road

Below Elevation 665 1 house 500 feet of Locke Road

Geologic Conditions:

The left abutment is glacial till, shallow to bedrock. The right abutment is sand and gravel terrace at lower elevations and glacial till at higher elevations, shallow to bedrock. Depth to schist bedrock in the foundation is not known but may be 15 to 20 feet.

SITE NA-1020 (Cont'd)

Geologic Conditions: (Cont'd) There are leakage problems in the foundation and on the lower elevations in the right abutment. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 30 percent. Waterholding capabilities appear good provided a positive cutoff is made through the sand and gravel terrace in the foundation and the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1021

Location:

On Trapfall Brook approximately 400 feet upstream from Jones Hill Road in Ashby, Massachusetts.

Ashby Massachusetts Quadrangle

Latitude: 42°41'50" Longitude: 71°49'19"

Facilities Affected:

No facilities affected below elevation 880.

Geologic Conditions:

The right abutment is outwash sand and gravel and shallow to bedrock. The left abutment is glacial till silty sand with 30 percent cobbles and boulders, shallow to bedrock. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in the right abutment and the foundation. Impervious borrow material for dam construction is available on site. Waterholding capabilities appear fair depending upon whether a positive cutoff is made on the right abutment.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

On a tributary to Trapfall Brook approximately 1400 feet downstream from Mason Road in Ashby, Massachusetts.

Ashby, Massachusetts Quadrangle

Latitude: 42°41'26" Longitude: 71°48'04"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (191 acres). Therefore, no further investigations were made.

SITE NA-1023

Location:

On a tributary to the Squannacook River approximately 850 feet upstream from Townsend Road in Groton, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°38'20" Longitude: 71°38'57"

Facilities Affected:

Below Elevation 270

3000 feet of Townsend Road

Geologic Conditions:

The left abutment is thin silty sand and gravel underlain by till or bedrock. The right abutment is outwash sand and gravel. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction is available on site; however, rock size greater than 6 inches may run 15 percent. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

On a tributary to Trapfall Brook approximately 3000 feet upstream from Foster Road in Ashby, Massachusetts.

Ashby Massachusetts Quadrangle

Latitude: 42°41'14" Longitude: 71°47'33"

Facilities Affected:

No affected facilities below elevation 735

Geologic Conditions:

Both abutments are englacial drift or glacial till with cobbles and boulders. Depth to bedrock in the foundation is not known. There are no apparent leakage problems. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1025 -- FITCHBURG RESERVOIR

Location: On Willard Brook, 1500 feet upstream

of Richardson Road in Ashby, Massachusetts.

Ashby, Massachusetts-N.H. Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
11.7	30	7.21.0	0.1
147	30	1340	()

Potential

for

Expansion: Limited by size of drainage area.

Remarks: This is an earth dam with a 70 foot wide

ogee spillway. Upstream slope of the dam is rip-rapped. Dam and spillway are in

good condition.



SITE NA-1026 -- HARBOR POND

Location: Upstream of Harbor Road in Townsend,

Massachusetts.

Townsend, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
)13	13	38.1100	60

Potential

for

Expansion: Expansion limited by Boston and Maine Railroad

and houses on left abutment.

Remarks: This is a stone block masonry dam.

The spillway is about 90 feet wide.

Structure is in fair condition.



SITE NA-1027 -- GRAVES POND

Location:

100 feet upstream of Emery Road in

Townsend, Massachusetts.

Townsend, Massachusetts Quadrangle

Surface Area (Acres)

Height of Dam (Ft.)

Drainage Area
(Acres) (Sq. Mi.)
680 1.06

Potential

for

Expansion:

Some expansion of the pond is possible.

Remarks:

This is a small dam. The spillway is constructed of stone rubble masonry.

Both the dam and weir are in poor condition.

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** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

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-YR PRIN SPWY DESIGN STORM RUNDFF = 8.10 IN, PEAK FLOW =	-1019				05 02	н	368 AC	US		- ASH	BY MAS			TITUD			LONGIT		71-50-01
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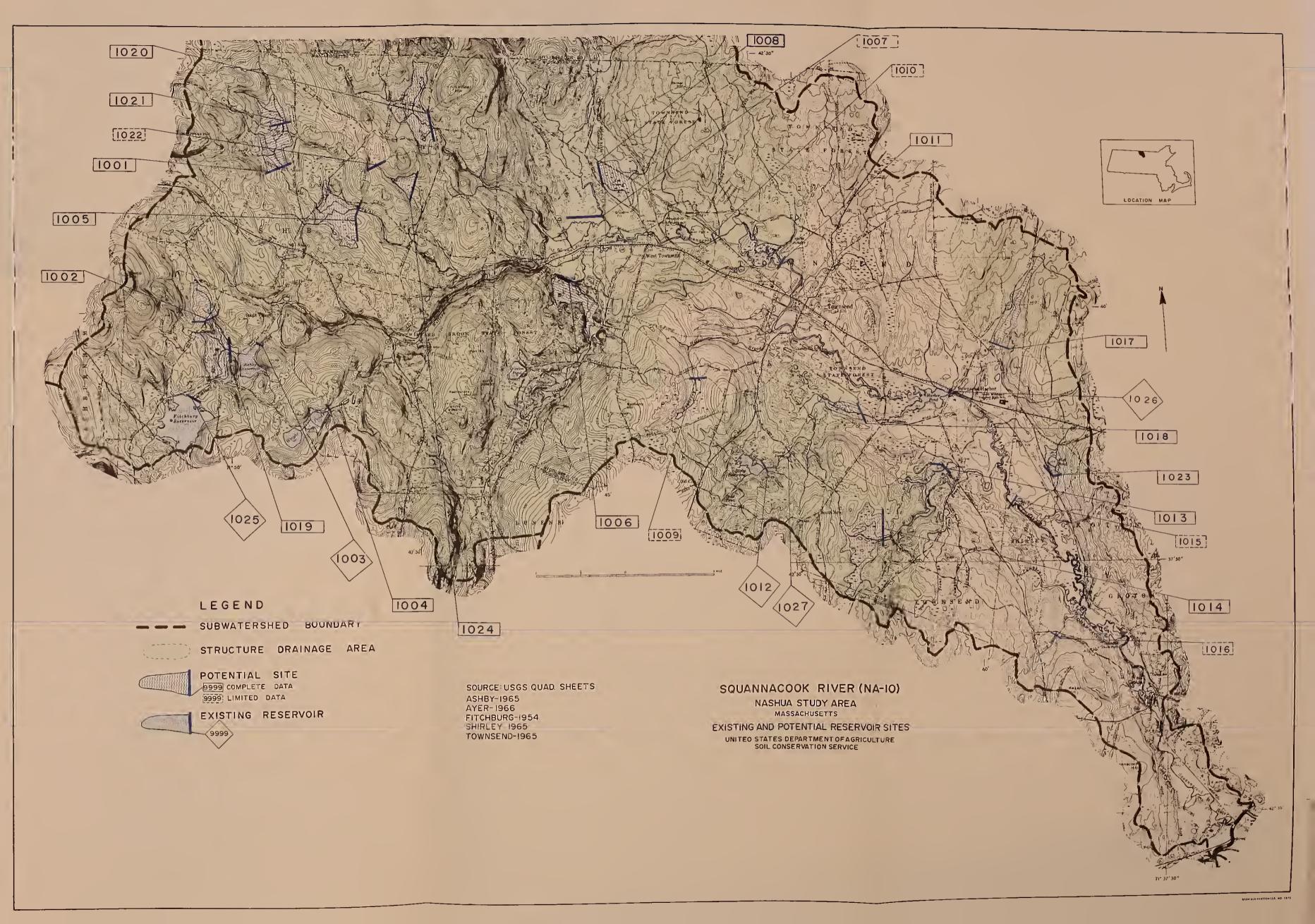
** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **

SUMMARY DATA FOR POTENTIAL UPSTREAM RESERVOIR SITES

STUDY AREA-NASHUA RIVER	* * *	* * *	STUDY	AREA-N	STUDY AREA-NASHUA RIVER	IVER	***	***	*	SUBMAT	ERSHED	SUBWATERSHED-SQUANNACOOK RIVER	ACOOK .	RIVER	*	*		*
		SENEF IC	BENEFICIAL POOL	OL				EMERGENCY SPILLWAY	ICY SPI	LLWAY	* *	* DESIGN * HIGH WATER	GN ATER		DAM	ner Kadawalan veri angementegan ngaw	* SAFE * YIELD	0
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							+				*						*	
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693.9	213	8.0	2650	19	30310	17.9	*	6.4 E		9.8	2140 *	698.5	21	8 - 002 -	8 25	77		25
702.0	383	14.3	1920	23	31590	26.0	e 70	4.5 E	447 16.7	6.7	1650 *	706.8	56	* 709.2	2 33	145	* 0.34	34
7.807		20.7	1630	28	32710	32.7	# 71	711.2 E	628 23.6	3.6	1440 *	713.5	29 #	* 716.4	04 40	224	*	99
712.7	199	25.0	1500	58	34430	36.7 *		5.2 E	743 27.9	6.7	1340 *	717.5	30 *	* 720.2	2 44	276	*	15
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		DOLAR L	A A A A	DASE	200	EL IMIN	AK A TIN	LUKMAL	UN. T	GURES	SHUMIN	AKE TRI	MARIET	חטא כר	TEAR I SO	אטר א	USES.	
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			*	N 00 *	OT USE	FOR FI	VAL SI	TE SELE	CTION	OR LAN	D ACQU	** DO NOT USE FOR FINAL SITE SELECTION OR LAND ACQUISITION. **	**					

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Notes





NASHUA STUDY AREA SITE DATA FOR

Subwatershed NA-11, Nashua River

The Massachusetts portion of this subwatershed covers about 31,600 acres in Ayer, Dunstable, Groton, Pepperell and Townsend, all in Middlesex County.

The Nashua River flows northeasterly through the watershed from Ayer through Groton and Pepperell into New Hampshire. The main tributary is the Nissitissit River, which originates in New Hampshire and flows southeasterly through Pepperell to the Nashua River. Elevations in Massachusetts range from a high of about 590 feet at Townsend Hill to about 170 feet on the Nashua River flood plain. Geology in the subwatershed is characterized by schist bedrock at depths of 15 to 25 feet, overlain by glacial till, englacial drift or outwash sand and gravel.

Twenty-four potential reservoir sites and two existing reservoirs were studied. Design summaries are included for eight potential sites that met survey criteria.

SITE NA-1101

Location:

On Bancroft Brook approximately 1800 feet upstream from Route 113 in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°39'03" Longitude: 71°38'22"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (200 acres). Therefore, no further investigations were made.

SITE NA-1102

Location:

On Robinson Brook approximately 4900 feet upstream from Shirley Street in Pepperell, Massachusetts.

SITE NA-1102 (Cont'd)

Townsend, Massachusetts Quadrangle

Latitude: 42°38'08" Longitude: 71°37'37"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (less than 0.5 square miles). Therefore, no further investigations were made.

SITE NA-1103

Location:

On Robinson Brook approximately 2,700 feet upstream from Shirley Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°37'59" Longitude: 71°37'08"

Facilities Affected:

Below Elevation 280 350 feet of Route 119

Below Elevation 270 No facilities affected

Geologic Conditions:

Both abutments are thin discontinuous outcrops of outwash sand and gravel underlain by silty sand and limey schist bedrock. Depth to bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Waterholding capabilities would be good with a cutoff to till or bedrock. Limey shale appears to be tight but drilling would be required to determine permeability.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

On Bancroft Brook approximately 400 feet upstream from Route 119 in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°38'17" Longitude: 71°37'12"

Facilities Affected:

Below Elevation 320

Below Elevation 300

2 houses 2 houses 800 feet of Bancroft Street

500 feet of Townsend St. (Rte. 113)

Below Elevation 290
1 house

Geologic Conditions:

Both abutments are thin discontinuous outwash sand and gravel underlain by schist bedrock. There is bedrock at the surface high on the right abutment. Depth to schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear good if a cutoff is made to bedrock.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1105

Location:

On a tributary to the Nashua River approximately 700 feet upstream from Mt. Lebanon Street in Pepperell, Massachusetts.

Pepperell Massachusetts Quadrangle

Latitude: 42°38'39" Longitude: 71°36'24"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (259 acres). Therefore, no further investigations were made.

Location:

On a tributary to Sucker Brook approximately 3,300 feet upstream from Heald Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°39'54" Longitude: 71°37'12"

Facilities Affected:

Below Elevation 320

Below Elevation 310

3 houses 1 house 2000 feet of Jewett Street 2000 feet of Jewett Street

Geologic Conditons:

Both abutments are silty sand and gravel glacial till with cobbles and boulders. Depth to schist bedrock in the foundation is not known but may be 20 to 25 feet. There are no apparent leakage problems. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 15 percent. Water-holding capabilities appear good.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1107

Location:

On a tributary to Gulf Brook approximately 650 feet upstream from Cranberry Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°41'08" Longitude: 71°38'26"

Remarks:

Drainage Area: 496 acres
This site does not meet criteria for this study.
At the maximum feasible pool level, the depth
at dam is less than 7 feet. Therefore, no
further investigations were made.

Location:

On Gulf Brook approximately 100 feet downstream from Oak Hill Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

Latitude: 42°41'30" Longitude: 71°37'47

Facilities Affected:

Below Elevation 310 Below Elevation 300

2 houses 1 barn

2 barns 900 feet of Oakhill Street 900 feet of Oakhill Street 1150 feet of Cranberry Street 1150 feet of Cranberry Street

Below Elevation 290

Below Elevation 280

700 feet of Oakhill Street 425 feet of Oakhill Street 650 feet of Cranberry Street 100 feet of Cranberry Street

Geologic Conditions:

The right abutment is thin englacial drift or till underlain by grey schist. The left abutment is outwash sand and gravel with possible grey schist in the core of the abutment. Depth to bedrock in the foundation is not known but may be 25 to 30 feet. There are leakage problems in the left abutment and possibly in the foundation. Impervious borrow material for dam construction is available on site; however, it contains cobbles and boulders. Waterholding capabilities appear poor to good depending on a possible cut-off.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1109

Location:

On Sucker Brook approximately 100 feet upstream from Blood Street in Pepperell, Massachusetts.

SITE NA-1109 (Cont'd)

Pepperell, Massachusetts Quadrangle

Latitude: 42°40!20" Longitude: 71°36'42"

Remarks: 1. 5 m's

Drainage Area: 116 Acres This site was eliminated from further study because of high damage to facilities. Woodlawn Cemetery, roads and new subdivisions are affected.

SITE NA-1110

Location:

On Sucker Brook approximately 1700 feet downstream from Oak Hill Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°41'13" Longitude: 71°36'37"

Facilities Affected:

Below Elevation 280 Below Elevation 270 5 houses 4 houses 4 barns 3 barns

425 feet of Sartelle St. 425 feet of Sartelle St. 2400 feet of Oak Hill St. 2400 feet of Oak Hill St.

Below Elevation 260

1 house

2 barns

1000 feet of Sartelle Street 1380 feet of Oak Hill Street

Geologic Conditions:

Both abutments are outwash sand or gravel. Depth to schist bedrock in the foundation is not known but may be 40 to 50 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is on the left abutment.

Location:

On Nissitissit River approximately 1900 feet upstream from Prescott Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°41'36" Longitude: 71°35'56"

Remarks:

Drainage Area: 55 square miles
This site does not meet criteria for this
study due to size of contributing drainage
area. (Drainage area larger than 50 square
miles); therefore, no further investigations
were made.

SITE NA-1112

Location:

On a tributary to Nissitissit River at a side road extending from Elliott Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°41'17" Longitude: 71°34'34"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (170 acres). Therefore, no further investigations were made.

SITE NA-1113

Location:

On a tributary to Sucker Brook approximately 1700 feet upstream from Dow Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°42'08" Longitude: 71°34'18"

SITE NA-1113 (Cont'd)

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area. (145acres). Therefore, no further investigations were made.

SITE NA-1114

Location:

On Unkety Brook approximately 250 feet downstream from River Street in Dunstable, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°41'24" Longitude: 71°32'55"

Remarks:

Drainage Area: 4400 acres
This site was eliminated from further
study due to high facility damage and
limited storage. The Boston and Maine
Railroad crosses the pool area.

SITE NA-1115

Location:

On Unkety Brook approximately 1900 feet upstream from River Street in Dunstable, Massachusetts.

Pepperell Massachusetts Quadrangle

Latitude: 42⁰41'24" Longitude: 71⁰32'44"

Remarks:

Drainage Area: 4276 acres
This site does not meet criteria for this study. At maximum top of dam elevation, water depth is less than 7 feet. No further investigations were made at this site.

Location:

On tributary to Unkety Brook approximately 1500 feet from confluence with Unkety Brook in Dunstable, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°40'51" Longitude: 71°32'08"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (270 acres). Therefore, no further investigations were made.

SITE NA-1117

Location:

On Unkety Brook approximately 500 feet upstream from Cowell Road in Dunstable, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°40'04" Longitude: 71°31'55"

Facilities Affected:

Below Elevation 210

9 houses
6 barns
18 wooden power poles
2000 feet of Groton Street
Below Elevation 205
7 houses
4 barns
13 wooden power poles
25 feet of Groton
Street

Below Elevation 200

1 house

l barn

7 wooden power poles 1100 feet of Groton Street

Geologic Conditions:

Both abutments are outwash sand and gravel. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There are leakage problems in both abutments and possibly in the foundation. Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

SITE NA-1117 (cont'd)

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1118

Location:

On Reedy Meadow Brook 2300 feet upstream from Route 113 in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°39'39" Longitude: 71°34'00"

Facilities Affected:

Below Elevation 230

l house

800 feet of Nashua Road

1800 feet of Longley Street-Groton Street

Geologic Conditions:

The right abutment is a sand and gravel esker. The left abutment is thin glacial till underlain by schist bedrock. Depth to schist bedrock in the foundation is not known, but may be 40 to 50 feet. There is a leakage problem in the right abutment. Impervious borrow material for dam construction is available on site; however, it contains cobbles and boulders. Waterholding capabilities appear poor. The esker on the right abutment is silty where checked, but probably has high permeable zones.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

Location:

On James Brook approximately 300 feet upstream from Route 111-125 in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°34'44" Longitude: 71°35'15"

Facilities Affected:

This site has been eleiminated from further study due to excessive diking required and many houses affected.

Geologic Conditions:

Both abutments are poorly graded sand and gravel outwash swampy along the stream. Depth to phylitte or schist bedrock in the foundation is not known but may be 15 to 25 feet.

There are leakage problems in both abutments.

Impervious borrow material for dam construction was not located on site. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1120

Location:

On James Brook approximately 300 feet upstream from Shirley Road in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°34'52" Longitude: 71°35'51"

Facilities Affected:

This site was eliminated from further study due to excessive dam length and facilities affected.

SITE NA-1120 (Cont'd)

Geologic Conditions:

The left abutment is poorly graded sand and gravel outwash with swamp at low elevations. The right abutment is silty sand glacial till at the top of the abutment and outwash and swamp at lower elevations. Depth to granite or schist bedrock in the foundation is not known but may be 15 to 25 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction is available on site; however, rock greater than 6 inches may run 25 to 30 percent. Waterholding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the right abutment.

SITE NA-1121

Location:

On a tributary to James Brook approximately 450 feet upstream from the Boston and Maine Railroad in Ayer, Massachusetts.

Ayer, Massachusetts Quadrangle

Latitude: 42°34'21" Longitude: 71°34'52"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (224 acres). Therefore, no further investigations were made.

SITE NA-1122

Location:

On Gulf Brook approximately 800 feet downstream from Lawrence Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle

SITE NA-1122 (cont'd)

Latitude: 42°41'53" Longitude: 71°38'08"

Facilities Affected:

Below Elevation 285 3 houses Below Elevation 280

2 houses

550 feet of Oak Hill Street 400 feet of Oak Hill St. 600 feet of Chestnut Street 600 feet of Chestnut St. 3800 feet of Lawrence Street 3800 feet of Lawrence St.

Below Elevation 275

1 house

600 feet of Chestnut Street 3800 feet of Lawrence Street

Geologic
Conditions:

Both abutments are ice contact sand and gravel and cobbles. There could possibly be bedrock or glacial till core in the hills. There are till outcrops high on the right abutment. Depth to schist bedrock in the foundation is not known but may be 35 to 40 feet. There are leakage problems in both abutments and the foundation. Impervious borrow material for dam construction was not located on site. Water-holding capabilities appear poor.

Engineering Notes:

The recommended location for an emergency spillway is at the left abutment.

SITE NA-1123

Location:

On Nissitissit River approximately 5000 feet upstream from Hollis Street in Pepperell, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°41'13" Longitude: 71°35'16"

Remarks:

Drainage Area: 57 square miles
This site does not meet criteria for this
study. The contributing drainage area
is larger than 50 square miles. No further
investigations were made.

Location:

At outlet end of marsh area near Wattles Pond approximately 100 feet upstream from Boston and Maine Railroad in Groton, Massachusetts.

Pepperell, Massachusetts Quadrangle

Latitude: 42°38'51" Longitude: 71°34'38"

Remarks:

This site did not meet criteria for this study due to the small contributing drainage area, (155 acres). Therefore, no further investigations were made.

SITE NA-1126 -- HEALD POND

Location:

On Gulf Brook at Heald Street in

Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
22	6	315	0.5

Potential

for

Expansion:

Could be expanded by raising Heald Street.

Remarks:

This is a small concrete and stone structure at the Heald Street road culvert. Weir notch is about 18-inches wide and 18-inches deep. Spillway is in poor condition.



SITE NA-1127 -- COON TREE POND

Location:

Between Townsend Street and Jewett Street in Pepperell, Massachusetts.

Townsend, Massachusetts Quadrangle.

Surface Area	Height of	Drainage	Area
(Acres)	Dam (Ft.)	(Acres)	(Sq. Mi.)
35	3	190	0.3

Potential

for

Expansion:

Expansion is possible, but the drainage area is quite small. Dikes would be required at both ends of the pond.

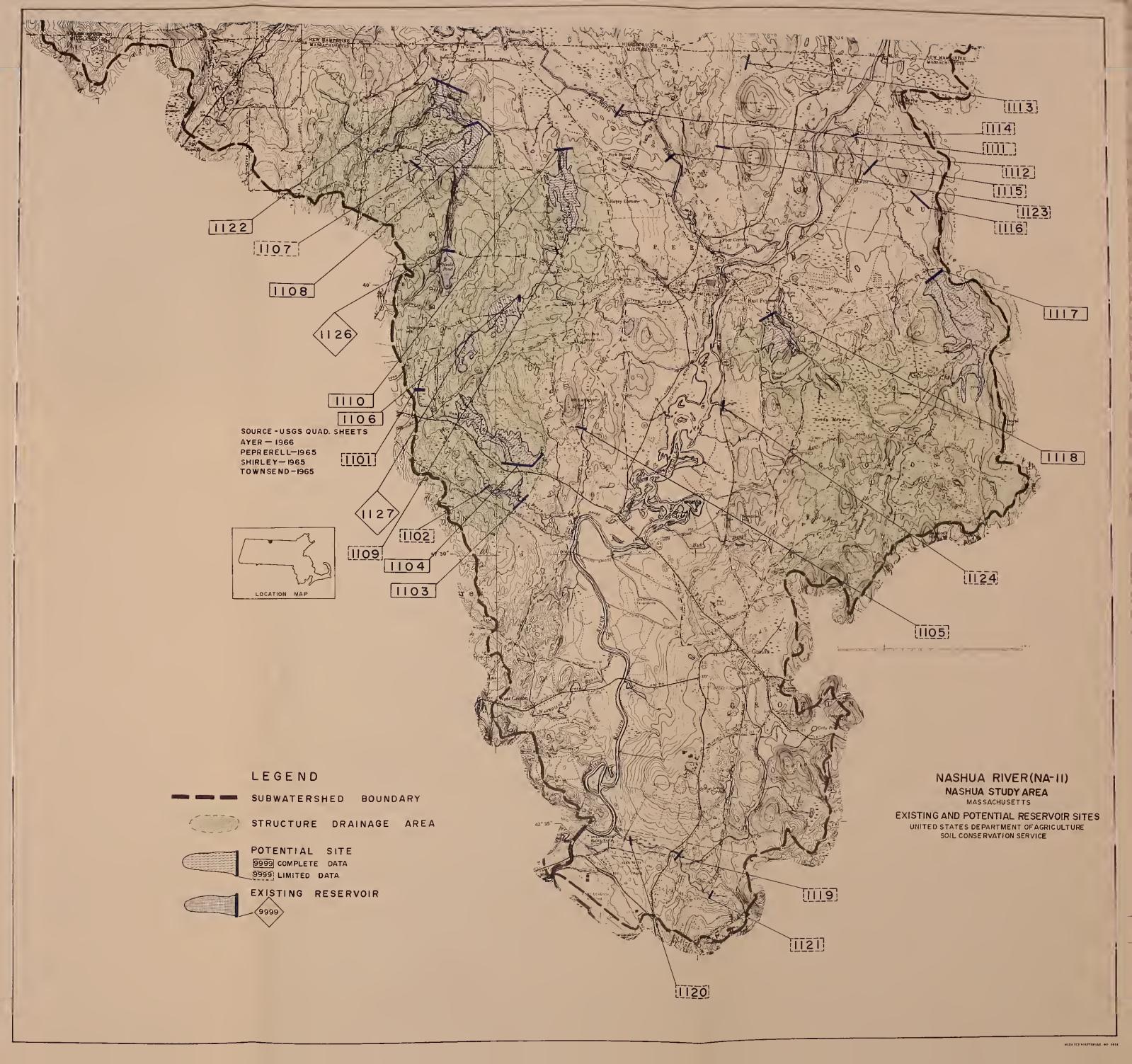
Remarks:

This is a shallow flooded area with exposed tree trunks in the pond. There is an earth dam, but no constructed spillway. Flows pass over a low area of the dam. Structure is in poor condition.

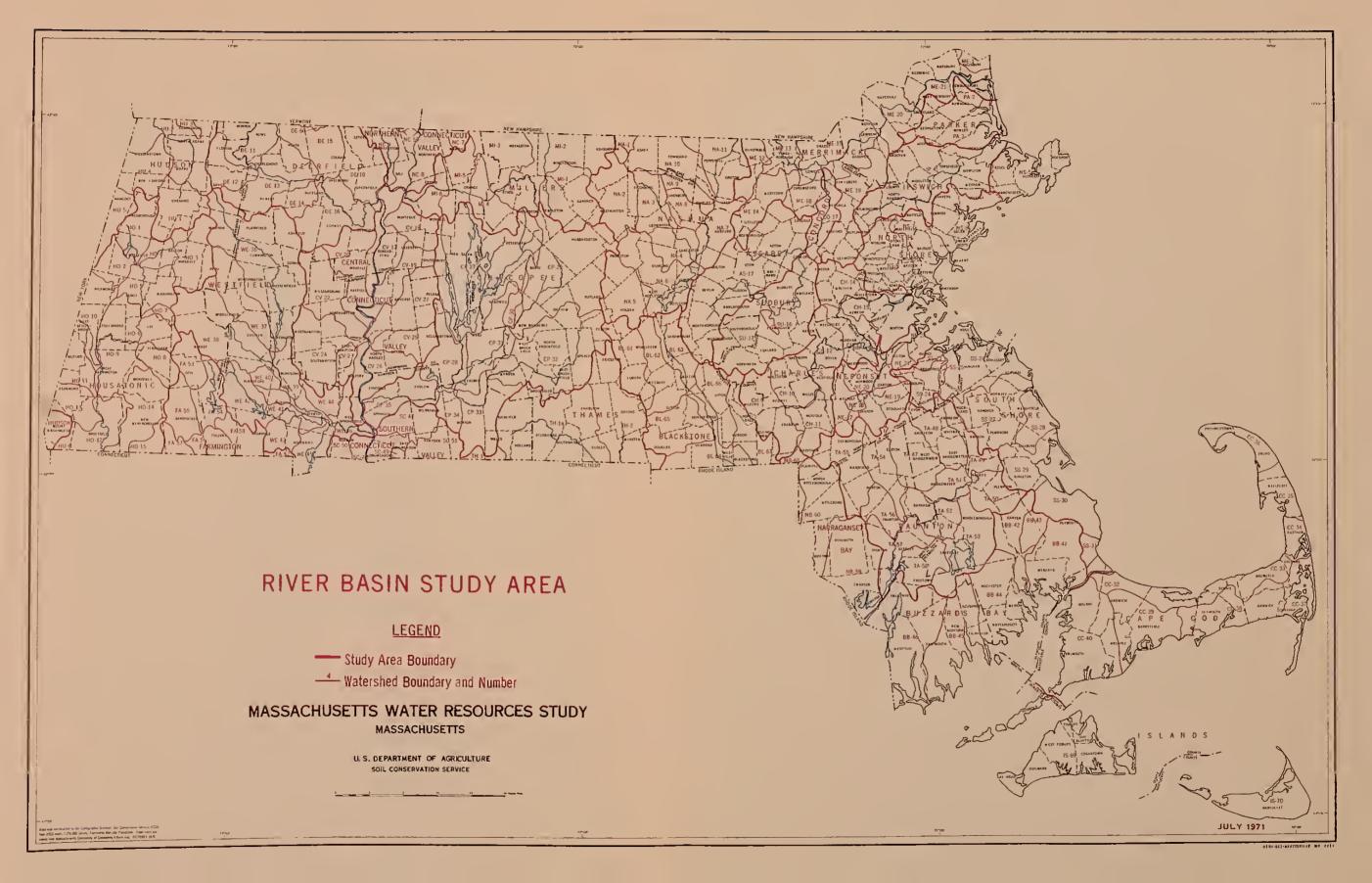
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RAGE PER AREA SURF AT * ELEV AT CREST PER AC ET IN (\$) 1.0 (\$) (AC) (\$) (FT) * (MSL) AC FT IN (\$) ***********************************	# ELEV AREA * ELEV HGT VOL *CHAN * (MSL) (AC) * (MSL) FT CY) * (MG ***********************************
IN (\$) (AC) (\$) (FT) * (MSL) AC FT IN (\$)	# (MSL) (AC) * (MSL) FT CY) * (MG ************************************
**************************************	######################################
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EMERGENCY SPILLWAY TYPE CODE- C=CONCRETE CHUTE, D=CONCRETE DROP,	E=EXCAVATED, T= TWO SPILLWAYS, N= NONE
TABULAR DATA ARE BASED ON PRELIMINARY INFORMATION. FIGURES SHOWN	
ARE SHOWN TO THE NEAREST 0.	I FOOT TO SHOW VARIATION BETWEEN DEVELOPMENTS ONLY, AND ARE NOT TO
CONSIDERED ACCURATE TO THAT DEGREE.	

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APPENDIX 1

MUNICIPAL INDEX OF SITES

City or Town	Site No.	Narrative <u>Information</u>	Design Summary
Ashburnham	0104 0105 0106 0109 0110 0111 0112 0113 0202 0203 0204 0205 0219 0225 0226 0233 0243	Page 10 11 11 13 15 16 16 16 22 22 22 23 24 33 36 38 44 54	Page 18 18 19 55 55 55 55 56 58 59
Ashby	0101 0102 0103 0107 0108 1001 1002 1003 1004 1005 1019 1020 1021 1022 1024 1025	7 8 9 12 13 243 244 245 246 246 256 257 258 259 260 261	17 17 18 19 264 264 265 267 268 268
Ayer	0711 0720 0721 0722 0723 0724 1119 1120 1121	190 197 198 199 200 201 281 281 282	

City or Town	Site No.	Narrative <u>Information</u>	Design Summary
Bolton	0418 0701 0702 0715 0716	Page 96 183 184 193 193	Page 202 202 204 205
Boylston	0632 0633 0634	166 167 167	180 181
Clinton	0620 0621 0637 0638	157 158 171 172	178 178
Dunstable	1114 1115 1116 1117	278 278 279 279	 288
Fitchburg	0208 0228 0238 0239 0242 0301 0302 0303 0304 0305 0306 0310 0318 0321 0322 0324	25 40 49 50 53 61 62 62 63 63 64 67 73 76 77 79 80	82 82 82 83
Gardner	0201 0209 0218 0229	21 26 32 40	 58 60
Groton	1023 1124	259 284	268

City or Town	Site No.	Narrative <u>Information</u> Page	Design Summary Page
Harvard	0702 0703 0704 0709 0710 0719	184 185 186 188 189	202 202 202 203
Holden	0509 0510 0511 0512 0513 0514 0515 0516 0517 0519 0520 0521 0522 0523 0524 0525 0526 0528 0531 0532 0531 0535 0537	110 111 111 112 113 113 114 115 116 117 118 119 119 119 119 119 120 121 122 123 126 127 128 129 130 132 132	135 135 136 136 137 137 138 138 138 138
Lancaster	0412 0415 0416 0417 0419 0420 0421 0629 0705 0706 0707 0708 0714 0717 0813 0815 0818 0821	93 94 95 95 96 97 98 164 186 187 188 192 194 216 217 219 222 225	102 103 103 180 203 203 204 205 228 228

		Narrative	Design
City or Town	Site No.	Information	Summary
		Page	Page
Leominster	0217	31	57
	0240	51	
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	0312	68	
	0313	68	80 OK
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	0626	161	179
	0636	170	117
	0805	210	226
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	0326	81	and two
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	0909	238	= ∞
Paxton	0529	124	GR 0153
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City or Town	Site No.	Narrative Information	Design Summary
Pepperell	1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1118 1122 1123 1126 1127	Page 271 271 272 273 273 274 274 275 275 276 277 277 280 282 283 285 286	287 287 287 288 288 289 289
Princeton	0602 0603 0604 0605 0606 0607 0608 0627 0635	142 142 143 144 144 145 146 162 169	173 173 173 174 174 174 175 179
Rutland	0506 0507 0508 0536	109 109 110 131	134 135
Shirley	0712 0713 0718 0809 0810 0816 0817 0904 0905 0906 1015 1016	191 192 195 214 215 216 218 233 234 235 254	201; 205 227 228 239 2140 2140

City or Town	Site No.	Narrative Information	Design Summary
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Sterling	0404	87	
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	0407	89	101
	0408	90	
	0409	91	
	0410	91	102
	0411 0414	92 94	102
	0609	148	
	0610	149	175
	0611	150	175
	0612	151	176
	0613	152	
	0614	152	176
	0615	153	176
	0616	15,4	177
	0619	159	O
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	1014	253	266
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	0224	33 34 35 35 36	59
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		Narrative	Design
City or Town	Site No.	Information	Summary
		Page	Page 59
Westminster	0227	Page 39	59
	0230	41	
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	0235	46	= em
	0236	47	
	0237	48 52	
	05/17	52	
	0601	141	
West Boylston	0518	117	137
	0617	155	177
	0618	156	177
	0625	161	con ess

Appendix - 2

OWNERSHIP AND USE OF EXISTING SITES

The following information details the ownership and use of the existing reservoirs in the Nashua Study Area. The data were obtained from records maintained by the Massachusetts Department of Public Works, Division of Waterways.

Site Number	Name	Apparent Owner	Present Use
0110	Marble Pond	Mrs. Oscar L. Marble	Private
0110	Harbre Tona	MIS. OSCAL IS MAIDIC	1111400
0213	Burnt Mill Pond	Westminster Sportsmans' Club, Inc. Westminster, Mass.	Fishing
0226	Lake Wamanoag	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0227	South Ashburnham Reservoir	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0230	Meetinghouse Pond	City of Fitchburg, Mass. Water Dept.	Water Supply
0231	Crocker Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0232	Wachusett Lake	City of Fitchburg, Mass. Water Dept.	Water Supply
0233	Winnekeag Lake	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0234	Factory Village Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0235	Round Meadow Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0236	Partridge Pond	Town of Westminster, Mass.	Storage
0237	Wyman Pond	City of Fitchburg, Mass. Water Dept.	Recreation

Site Number	<u>Name</u>	Apparent Owner	Present Use
0238	Snowsmill Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Mill Pond
0239	Sawmill Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0240	Crow Hill Pond	Commonwealth of Massachusetts	State Park Recreation
0241	Crocker Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0242	MacTaggart's Pond	Weyerhaeuser, Inc. Fitchburg, Mass.	Storage
0308	Old Pages Pond	Fiske R. Jones	Private
0315	Haynes Reservoir	City of Leominster, Mass.	Water Supply
0317	Notown Reservoir	City of Leominster, Mass.	Water Supply
0319	Pierce Pond	Fitchburg Realty Corp. Mass.	Storage
0320	Rockwell Pond	Jafal Corporation Leominster, Mass.	Mill Pond
0321	Overlook Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply Distribution Resv.
0322	Green's Pond	Charles H. Greene Ice Co., Fitchburg, Mass.	
0323	Morse Reservoir	City of Leominster, Mass.	Water Supply
0324	Lovell Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply
0325	Scott Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply
0402	Leominster Recreation Area	City of Leominster, Parks Department	Recreation

Site Number	<u>Name</u>	Apparent Owner	Present Use
0405	Heywood Reservoir	Town of Clinton, Mass. Water Dept.	Water Supply
0422	Fall Brook Reservoir	City of Leominster, Mass. Water Dept.	Water Supply
0423	Lake Samoset	Lake Samoset Property Owners Association Leominster, Mass.	Recreation
0520	Pine Hill Reservoir	City of Worcester, Mass. Water Dept.	Water Supply
0528	Quinapoxet Reservoir	City of Worcester, Mass. Water Dept.	Water Supply
0529	Asnebumskit Pond	Town of Paxton, Mass.Water Dept.	Water Supply
0530	Streeter Pond	Mr. Al David Paxton, Mass.	Private
0531	Kendall Reservoir	City of Worcester, Mass. Water Dept.	Water Supply
0532 0533	Stump Pond Eagle Lake	Duesburg & Bosson Woolen & Spinning Co. Holden, Mass.	Mill Pond
0534	Unionville Pond	Metropolitan District Commission, Boston, Mass	· .
0535	Peter Carr's Pond	City of Worcester, Mass. Water Dept.	Water Supply
0536	Muschopauge Pond	Town of Holden Water Dept.	Water Supply
0609	Hycrest Farm Pond	Mr. Dino DeCarlo Sterling, Mass.	Private
0624	Stuart Pond	Mr. Walter G. Williams Sterling, Mass.	Private
0635	Paradise Pond	Commonwealth of Massachusetts	
0636	Bartlett Pond	Leominster Sportsman's Ass. Leominster, Mass.	Fishing

Site			
Number	Name	Apparent Owner	Present Use
0637	Wachusett Reservoir	Metropolitan District Commission, Boston, Mass	
0638	Coachlace Pond	Standard Burner Co. Clinton, Mass.	
0719	Bare Hill Pond	Town of Harvard, Mass.	
0821	Fort Pond		Recreation
0823	Lake Whalom	Town of Lunenburg, Mass.	
0909	Hickory Hills Lake	Hickory Hills Lake Corp. Lunenburg, Mass.	Recreation
1025	Fitchburg Reservoir	City of Fitchburg, Mass. Water Dept.	Water Supply
1026	Harbor Pond	Mr. Aksila Townsend, Mass.	Private

APPENDIX-3

This report is one of a series dealing with potential reservoir sites. Previous similar reports are:

- 1. Study of Possible Water Storage Areas, Ipswich River Watershed, January 14, 1965.
- 2. Study of Possible Water Storage Sites, Upper Housic River and Upper Housatonic River, February 1966.
- 3. A Study of Potential Reservoir Sites in Massachusetts, Hudson River Basin, January 1968.
- 4. A Study of Potential Reservoir Sites, Housatonic Study Area, Massachusetts, June 1969.
- 5. Inventory of Potential and Existing Reservoir Sites, Merrimack Study Area, Massachusetts, March 1970.
- 6. Inventory of Potential Reservoir Sites, Neponset Study Area, Massachusetts, October 1970.
- 7. Inventory of Potential and Existing Upstream Reservoir Sites, Thames Study Area, Massachusetts, January 1971.
- 8. Inventory of Potential and Existing Upstream Reservoir
 Sites, Parker and North Shore Study Area, Massachusetts,
 June 1971.

Potential reservoir site studies are now in progress for the Taunton, Narragansett Bay, Deerfield, and Chicopee Study Areas. Other reports will be prepared in future years for the remainder of the state. Basic data from which this report was prepared are on file in the Soil Conservation Service Office, 29 Cottage Street, Amherst, Massachusetts 01002.



